Railway Maintenance Engineer

Volume 17 CHICAGO—FEBRUARY, 1921—NEW YORK Number 2

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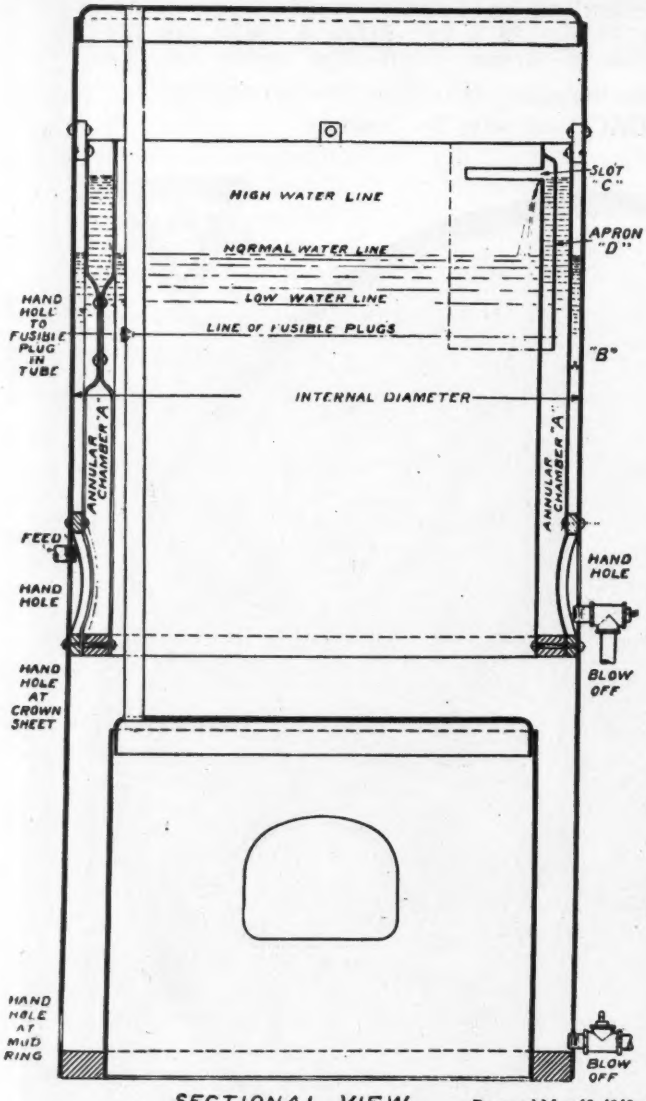

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Patented May 13, 1919, by T. T Parker.

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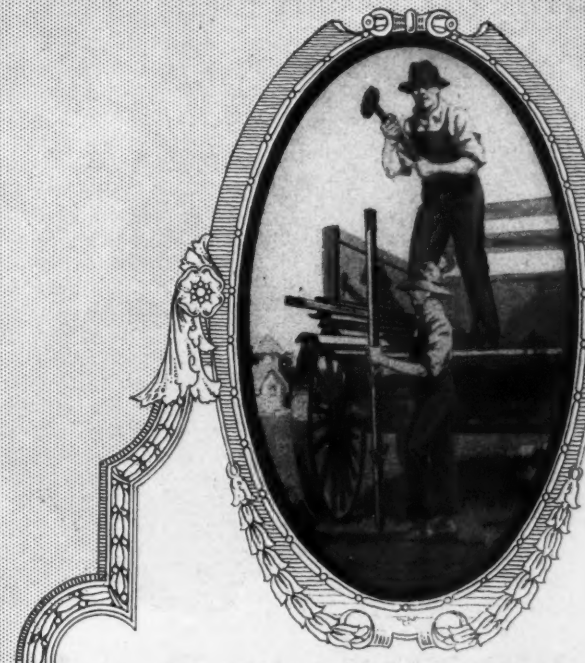

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We guarantee RED TOP Posts to be just as represented in our literature and advertising.

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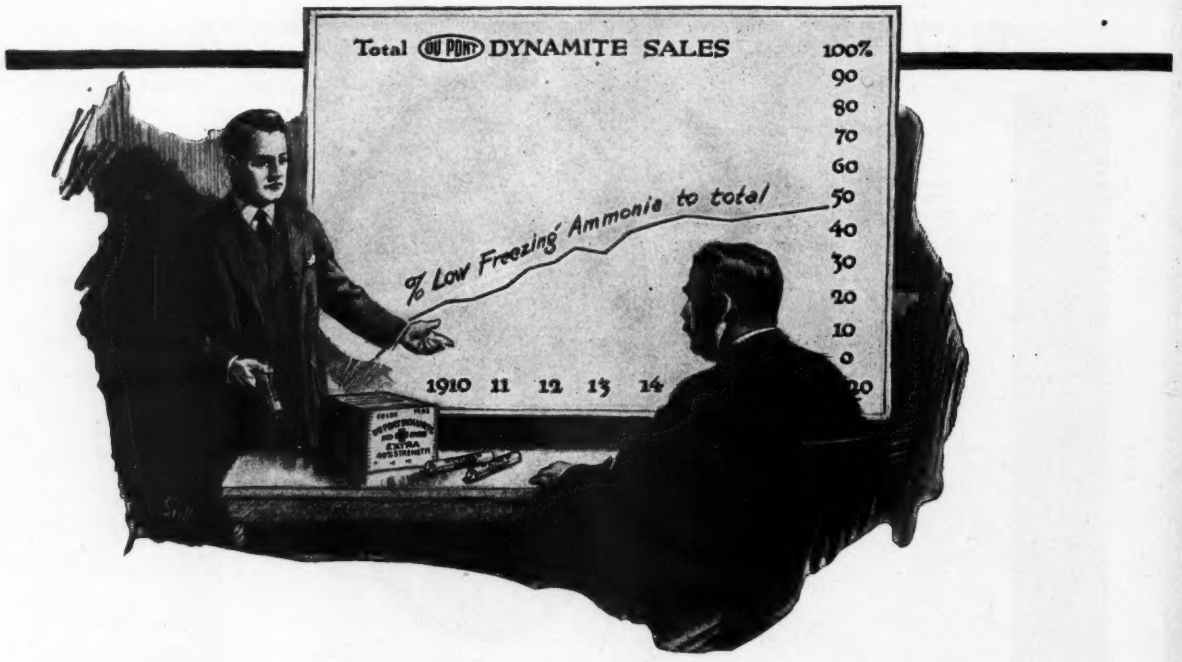

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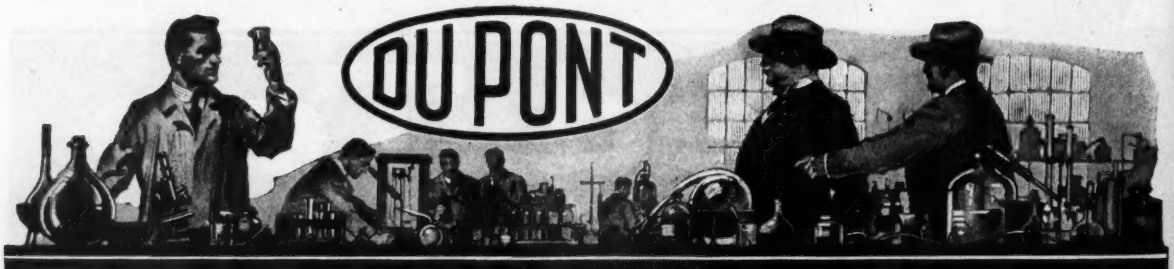
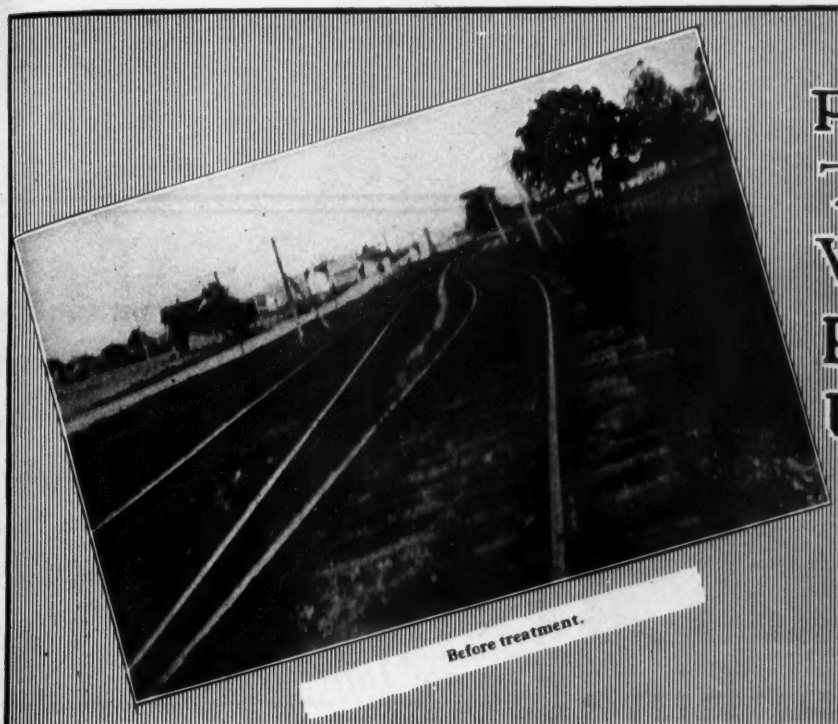


EXPLOSIVES ~ SERVICE



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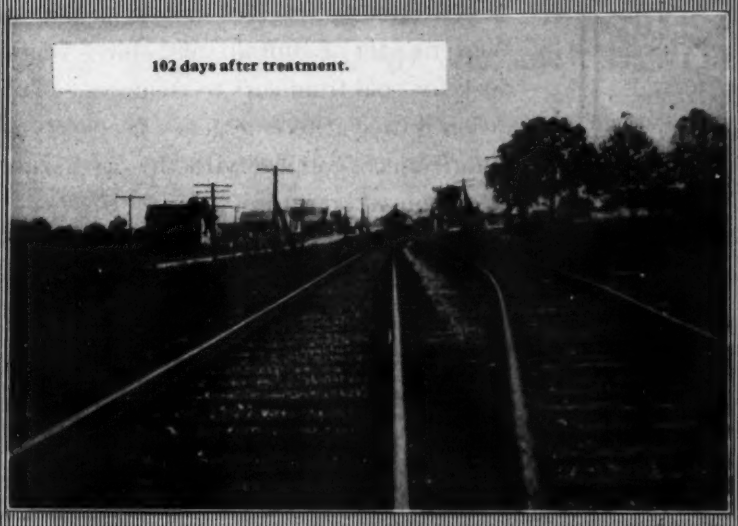
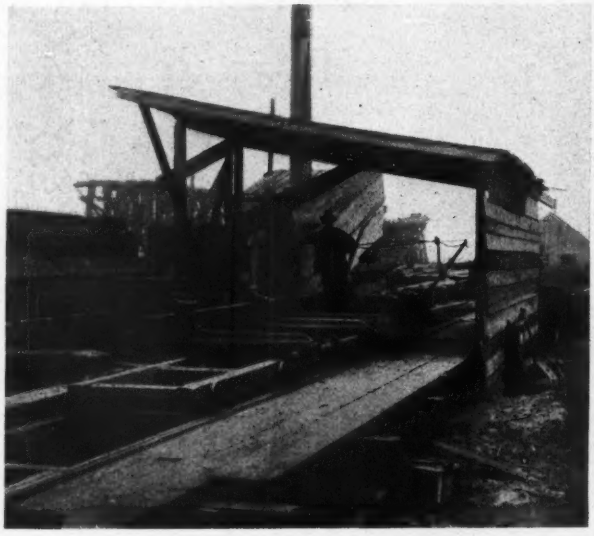


102 days after treatment.

This



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THIS is the American Portable Saw Mill which salvaged 80% of the 1,900,000 ft. b. m. contained in an old Lehigh Valley dock and coal trestle at Buffalo, N. Y., and which, by so doing, *gave that road 1,500,000 ft. b. m. of usable lumber at a saving in cost of from $35.00 to $75.00 per 1,000 ft. b. m.* Think of it—

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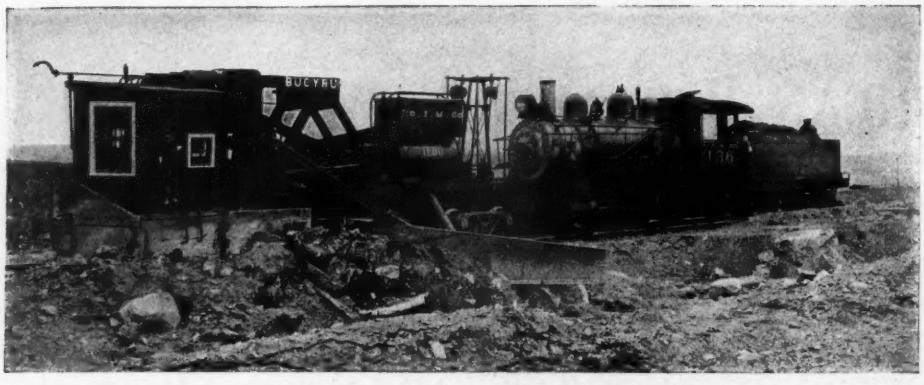

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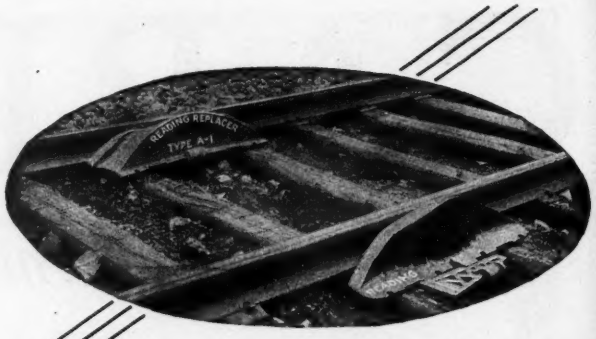

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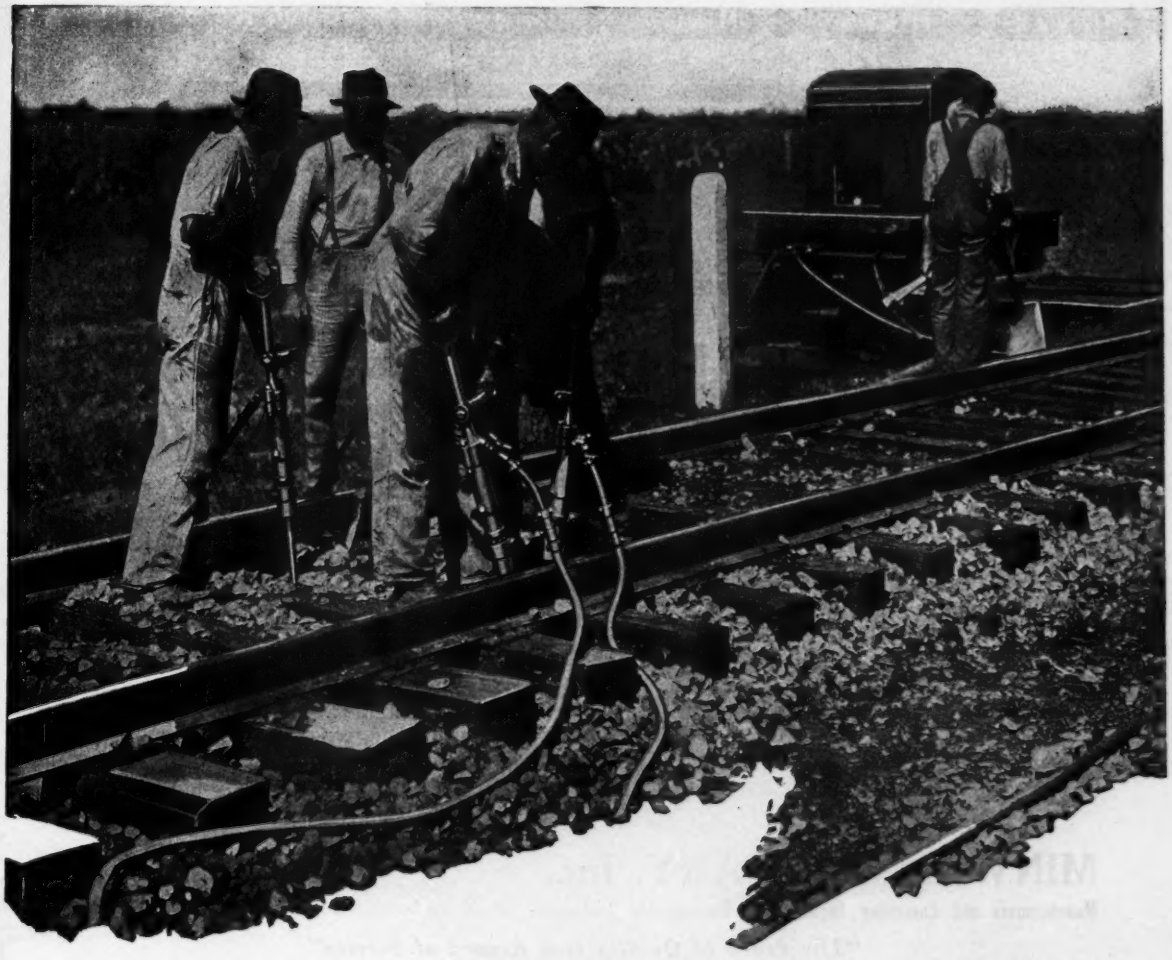

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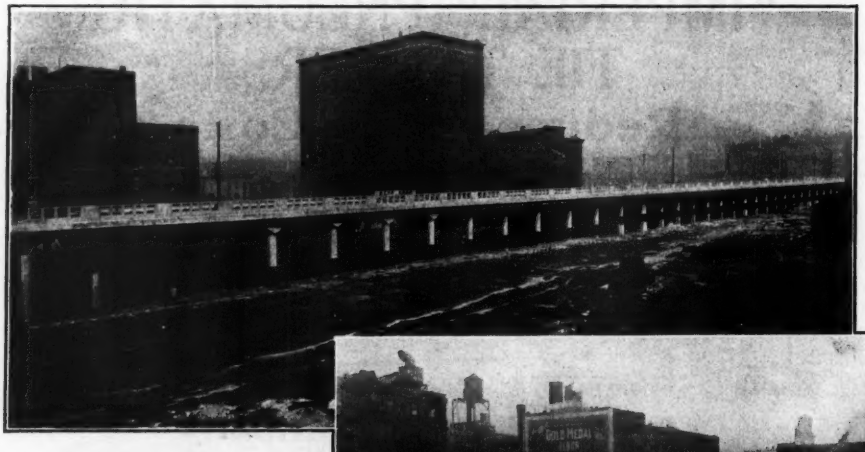

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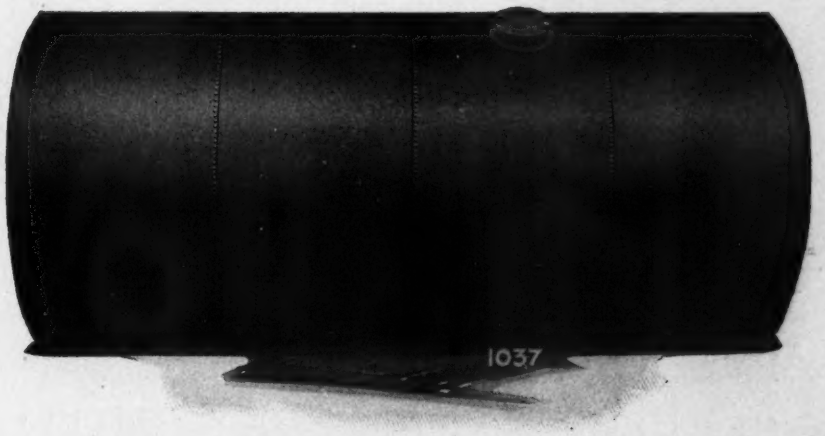

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Railway Maintenance Engineer

Vol. 17 February, 1921 Number 2

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age* and *Railway Engineering and Maintenance of Way.*)

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Make Your Plans Now

Information received from the secretaries of the American Railway Engineering Association and the National Railway Appliances Association indicates that the plans for the convention and exhibit to be held in Chicago during the week of March 14 are further advanced than usual at this time of the year. A. R. E. A. Bulletin No. 230 containing the reports of three of the committees has already been sent to the members, while the reports of nearly all of the others are now in the hands of the secretary and will soon be issued in bulletin form. In one respect Engineering week in Chicago for 1921 will differ from that of previous years. The one-day stated meeting of the Signal Division of the American Railway Association, which is usually held on Monday of that week, has been abandoned. However, the officers of the A. R. E. A. and the N. R. A. A. have announced that no deviation will be made from the plans as they are now being carried out.

The Treatment of Timber

On another page of this issue will be found the report of the convention of the American Wood-Preservers' Association which was held last week at San Francisco, Cal. This organization embraces only a small group of railway men. A large proportion of its members have no connection with the roads and a considerable part of the deliberations of this organization is of an extremely technical nature beyond the ken of those not immediately concerned with the treatment of timber. However, the presentation of this report and those of previous conventions of this association in our columns have not been aimed at the members of this association or other railway men directly concerned with the treatment of timber but at that large group of railway maintenance employees who are vitally interested with the *use* of treated timber. To obtain the full benefit of the outlay for treatment, the timber must be intelligently handled by users, and this cannot be insured unless the user has taken the trouble to acquaint himself with the general principles of timber treatment and those rules of good practice which have been laid down through years of experience with this branch of engineering. With the greater scarcity and increased cost of timber, there is an increasing necessity for securing the maximum possible life out of all wood used and it is only a question of time before nearly all wood that will be subjected to exposure to the elements will receive some form of treatment. Therefore, it behooves all users of wood to study this subject.

Keep Up the Good Work

An article appearing elsewhere in this issue serves to mark the progress which has been made steadily during the last four or five years in improving the housing of laborers, both in section and extra gangs. These measures for improving living accommodations were not taken up by the railroads through altruistic motives, the prime reasons for so doing were intensely practical. In the face of a

keen competition for labor, it was realized that wholesome quarters constituted no little inducement for the prospective employee. Furthermore, railway officers have come to realize that a man cannot do a good day's work if he has not been properly fed and has not had a place to sleep where he will be insured a good night's rest. One of these incentives for supplying first-class accommodations has been removed, for there is no longer a labor shortage. As it now stands, the men are compelled to take whatever work is offered them, no matter how disagreeable and uninviting the housing accommodations may be. This, however, constitutes no legitimate excuse for a lowering of the housing standards. The present labor surplus is at best temporary, but even if it should be of considerable duration, the railroads should continue to provide adequately for such men as they employ, since the best men will continue to go to those camps which provide wholesome quarters. But disregarding all these practical considerations, there is a certain intangible difference between decent living accommodations and squalid conditions which cannot be readily measured with dollars and cents. The distinction is there, nevertheless.

THE TRUE COST OF WORK

PRACTICALLY every project requires the expenditure of labor and material, with labor usually the predominating factor in costs. So far as numbers go, labor in railway work has become more or less standardized through years of repetition in performing the same or closely similar tasks. As a result, whenever expenditures must be reduced, certain classes of work are abandoned altogether, while in others the amount of labor heretofore called for is reduced little or none and so-called economies are effected solely by reducing either the grade or the amount of the materials to be used. For example, if a group of buildings require painting, past experience has shown that it will require a certain number of men working a certain number of days to do this work and that is used as a base.

To affect any economy, then, something must be sacrificed in the material and in this case it is usually the grade of the paint, although a closer study of the probable costs might show that the purchase and use of certain classes of labor-saving equipment would so reduce the labor item that a much smaller total cost would result, even though more and better materials were used. This is by no means restricted to the work cited—it is simply a case of the relative values of the regular price and less or poorer materials as compared with less labor and the same or better materials. The only true and accurate method for judging economies is that which compares the ultimate total costs of each plan, wherein all items contained in the plans have been analyzed thoroughly and fairly in relation to the use of modern labor-saving improvements.

A MUTUAL RESPONSIBILITY

The management has a duty to the employees; that is, good wages, good working conditions, and discipline fairly and impartially maintained. Kindness, courtesy and consideration are not incompatible with good discipline. Lax discipline is not kindness, for in your occupation lax discipline spells death and disaster.

The employees equally with the management have their responsibilities. Given fair wages and fair working conditions, the management has a right to expect and exact from the employees an honest day's work: prompt, willing and cheerful observance of orders: and economical use and care of the property intrusted to them.

The management has the right to ask the same kindness, courtesy and consideration to the officers and to the public on the part of the employees which the employees have the right to expect from their officers.—*General Atterbury to the Pennsylvania Employees.*

PRESENT AND FUTURE ECONOMIES

ANY consistent saving in expenditures is inevitably predicated on some form of records which will show quickly and conclusively just what has been done, how it was done and why and where, as well as what is to be done in the present and in the future. The more systematically this is developed and carried out the more satisfactory the results, while in contrast to the more commonly used methods for the reduction of expenditures by the curtailments of projects, materials, etc., there are no bad after effects. In a time like the present, heavy reductions in expenditures are inevitable and in the majority of instances justifiable, since the roads are facing serious financial conditions, though apparently of a more or less temporary nature. It is not too much to assume then that while reduced expenditures are, in a sense, the order of the day, it is not because they are considered desirable, and the work which is now being postponed or suspended will soon have to be undertaken and completed.

Once the roads are well started toward overcoming their present financial difficulties, maintenance programs will again be taken up and rapidly pushed. The accumulation of deferred work in itself will tend to produce waste and useless expenditures through multiplicity of efforts, lack of complete coordination in planning, eleventh - hour purchasing and distribution of materials, etc. Under these circumstances, any system or methods whereby closer administrative control can be effected to the resultant advantage of better distribution of material and labor and thence reduced overhead and costs, will be desirable.

As railroad management has progressed, cost and material distribution methods have also progressed, but not in the degree that they should. Better systems of planning and recording, either graphically or otherwise, or both are needed to keep up the advancement of railroading and to keep within possible future financial requirements.

Thus it would seem most advantageous at the present time to go into the question of systematic planning and recording, for what will be of benefit to the maintenance of way department a year or more from today in obtaining the maximum amount of work for a minimum of expenditures will be obviously of as great or greater benefit now when the most vital economics are sorely needed.

Systematic records, graphic representation, etc., are not exactly new to maintenance officers, but in general little has been done toward developing this side of maintenance of way work. A few roads have inaugurated well thought-out plans for some particular phase of the work, other roads have tried out some plans only to let them lapse. The practice has never in any sense been wide-

spread. In some cases there has been the complaint that systematic planning and recording are too elaborate or too complicated but the complaint is usually from those who have made no real serious attempt to do these things.

Others start out to develop a method but fail to keep it up-to-date, when the attempted system actually becomes a liability rather than an asset. Lack of time is the excuse of others, but the officer making the excuse will and often does waste enough time of his own and his staff in searching out some wanted feature, to keep the entire system up-to-date for a month. Nearly every officer has in odd moments sketched mentally or otherwise the outlines of a system to be worked out some "rainy" day adapted to his own particular road and its conditions in which there is to be incorporated all that has been learned from experience and from reading about work on other roads. But his plan is seldom carried out, even though he realize the need—it is always in the future, perhaps tomorrow—yet each road needs that engineering ability, that constructive thinking, and its constructive results as much, or more, today as it will in the future. In this case, the future should be a part of today.

THE NATIONAL AGREEMENT

AS stated elsewhere in this issue, the railroads are now presenting their case before the Railroad Labor Board for the abolishment of the National Agreements put into effect at the instance of the railway brotherhoods during the period of government control. The railroads are prompted in this movement by the necessity for saving money. The Esch-Cummins law and the rates established under it by the Interstate Commerce Commission are founded on the principle that the railroads are to prosper only as they are efficient and economical in their operations. The National Agreements introduce two fundamental obstacles which obstruct the efforts to obtain these ends. They provide that promotion, demotion and reduction in force shall be governed by seniority and they also embrace systems of rules for wage allowances for special classes of work or special conditions which when applied to the country at large cannot help but result in the payment of unreasonable amounts for work done under some of these special conditions. In other words, in the effort to cover all possible cases of discrimination or hardship to the men because of unusual conditions of employment, a very unworkable and extravagant system has been devised.

In the case of the maintenance of way department there is no question but that the primary objection to the National Agreement is the seniority rule. Aside from the introduction of the very cumbersome system of bookkeeping necessary to keep the records of seniority, it serves as a pernicious obstacle to the efforts of the management to reward the most industrious, faithful, energetic and intelligent members of the organization.

This does not mean that seniority should never play a part in picking the individual to be granted recognition or favor. As a matter of fact, it always has and always will be an important consideration. There never can be any substitute for loyalty and faithful service. These will *always* be recognized by the officer who is worthy of the name and seniority as well as ability are always taken into consideration jointly when opportunity for promotion is presented or necessity for reduction in force is confronted. The only class which has any reason to fear the abolishment of the seniority rule embraces those who do only enough work to avoid an open show of insubordination or who otherwise have indicated their lack of interest in the welfare of the company.

NEW BOOKS

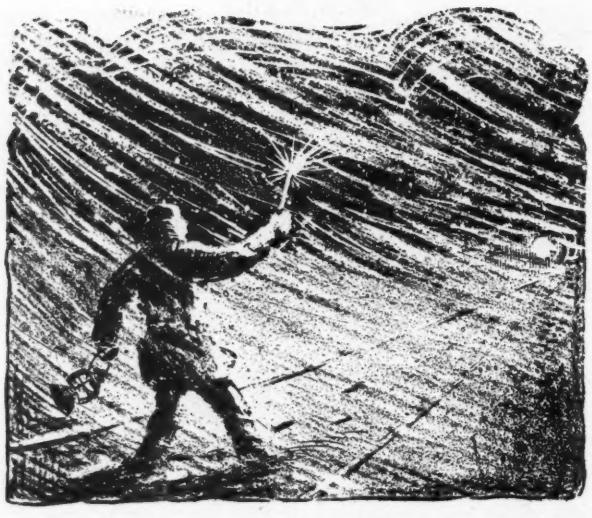
Railway Surveying and Permanent Way Work. 303 pages, illustrated, 6 in. by 9 in. Bound in cloth. Published by Edward Arnold, London, Eng., and distributed by Longmans, Green & Co., New York.

As its title suggests, this book is in reality divided into the two main subjects of railway surveying and of maintenance of way practice, or, stated according to English phraseology, of permanent way work. The book has a joint authorship, being the product of two English engineers, S. W. Perrott and F. E. G. Badger, both with experience not only on leading English roads, but in other countries as well. From their experience they have included in a part of the text a discussion of the detailed work in surveying, planning and constructing an economic railway in more or less undeveloped and tropical countries. In this section, as well as in the parts devoted to railway surveying, the subjects in question, such as reconnaissance, preliminary location, location, curves and construction, etc., are handled in a fairly detailed and fundamental member, though throughout there is assumed that the reader has an understanding of surveying to some degree or other.

With a few exceptions the discussion of the problems mentioned conforms to American terminology and practices. The permanent way or maintenance of way section, however, is more of a treatise of English methods of track preparation, construction and maintenance. While dealing in a fairly broad way with such general subjects as ties, ballast, rail and drainage, etc., the major portion covers the practical installation problems of sidings, switches, turnouts and cross-overs, etc. The book throughout is well illustrated with reproductions of actual field and office notes, sketches and maps for the first part as well as numerous other plans and drawings more directly concerned with the second part or permanent way section.

Concrete Work, by W. K. Hatt and Walter C. Voss, 5 in. by 7½ in., 452 pages, illustrated, bound in cloth, published by John Wiley & Sons, Ins., New York.

No book which has been published thus far on the subject of concrete and its uses seems to be intended so directly for the foreman and bridge and building supervisor as this new text book. The intent of the book is clearly to present the facts on concrete to the man who will actually do the work and this conception of motive is confirmed in the preface. For this reason, the book will fill a long felt want and the dissemination of the information it contains among practical workmen and foremen will probably do more to improve practice in concrete construction than any other factor recently effective in this field. The idea of the book is to present in simple language everything that the foreman or small contractor would need to know about the subject in order to carry on various forms of concrete construction. Among subjects covered are: The reading of architectural and engineering drawings, the preparation of small sketches or simple drawings, descriptions of tools and methods of using them, detailed explanations of the processes such as concrete mixing, the proper method of emptying cement sacks and of tying up the sacks for return, methods of building form work and placing and bending steel reinforcement, suggestions for plant layouts, etc. The book also contains considerable information on the details of construction for various parts of bridges and buildings, while an extended appendix in the back of the book is devoted to methods of taking the quantities off drawings and preparing estimates. Taken as a whole, the object of the book is to put in simple language as large an amount of the present knowledge of concrete technology as may practically be done.



"SWENSON, HE TELL ME, HOLD EVERYTHING"

BY CHARLES H. SMITH

THE MOTOR CAR slowed down and then stopped and Ole Larsen stepped down to the roadbed. Turning, he picked up a red lantern from the car floor, the globe carefully wrapped in a piece of bagging to screen the ruby glow.

"Got some torpedoes?" asked Swenson, the foreman.

"Yes—and red fusee," answered Ole.

Already the two pushers had started to shove the car forward. It was an emergency call and they, at least, appreciated the necessity of hurrying and getting the track repaired for No. 1.

"Remember, Ole," admonished Swenson as the car moved away, "remember—hold everything—" His voice was drowned by the explosion of the engine as it caught the spark.

"All right, Boss. Ay understand," shouted Ole as the engine, moving away, barked out its exhaust more rapidly.

For a few seconds Ole stood beside the track watching the rapidly disappearing motor car. It was snowing hard and soon the thick wall of white shut out even the glimmer of the lantern which the men carried on the car to afford them what scant protection against following trains that it might. Ole picked up his lantern and unfastened the covering so that the red rays gleamed from its sides and reaching into the pocket of his Mackinaw he drew forth two torpedoes and attached them to the rails directly opposite each other. He was not taking any chances in a snow storm like this.

The snow flakes fell in little swirls and eddies around his lantern. The storm had only begun and the wind wafted the flakes hither and yon in a manner that seemed to Ole playful. He wondered if a real storm was on its way. He hoped not. He, at least, knew the fury of a Dakota blizzard and had no wish to be out in one. Still, even if a blizzard should come he had nothing to fear. The job would not take long—and then Swenson would be back and the crew would go to the car house, build a fire and warm up before going home. He drew his big silver watch from his pocket. Eleven seventeen—not so very late. If the boys hurried and had good luck they should have the rail in within an hour or so. They only had a mile to go to get the rail, then pull the spikes, unbolt the angle bars, jerk the broken rail out and put the new one in its place. Re-bolt the angle bars on, re-spike and they would be about ready to start back. Eleven seventeen now. Allowing even two hours for the job the men should pick him up around one or one thirty.

The wind began to whip the corners of his coat and he realized that his feet were getting cold. Picking up his lantern he started walking up and down the track, keeping between the rails. First he walked eastward stamping his heavily-shot feet at each step in an effort to keep the circulation brisk. Then he turned back westward.

He had made perhaps fifty round trips when he realized that he had no way of judging just how far he was walking in each direction. Perhaps he had worked closer to where the men were changing the rail. He retraced his steps, going eastward—the opposite direction from the one the motor car had taken. For a few minutes he continued eastward and then he stopped and stood stamping his feet. But the cold becoming more intense he resumed walking, shuffling one foot along beside the rail until he struck an angle bar. When he had counted 10 joints he turned and retraced his steps, walking until he had counted 10 joints on the return trip. The snow underfoot hid the joints, but even if there had been bare ground he could scarcely have seen the angle bars, for the snow in the air was now driving past him in almost a straight line. A solid wall of white closed in on him as he took each step. It was coming from the Northwest, driven by a high, steady gale.

There was no doubt in Ole's mind about the storm now. A blizzard which might last two or three days had descended upon the prairie. He buttoned his big coat more tightly around his throat, arranged the meeting point of his sleeves and his mittens more carefully and pulled his cap down more closely on his head and over his ears. He drew out his watch. Eleven thirty-five! How slowly time crept! He could have sworn that it was long past midnight.

After replacing the big silver watch in his pocket he resumed his patrol. It wasn't so bad when he went eastward. Then the storm hit him from behind—coming as it did from the Northwest. But when he turned back westward he paid dearly for the immunity of his east trip. Not only did his fight against the icy blasts freeze the blood in his veins, but it wearied him greatly as well. The snow pellets driven by the gale hit his face like needles and the icy wind even penetrated through his heavy Mackinaw coat and struggling against the wind became a heavy task. He was prone to bend forward to brace his body against the force of the gale, but when he did this he knew that he could not have even the poor protection of sight against an approaching train. To hear one coming was almost unimaginable. The roaring of the wind drowned all sounds.

Ole thought of walking on the outside of the track, keeping close to the rail. This might be a little more safe than in the middle of the track. But he was too wise to chance the possibility of wandering away from the steel line. Once he lost the rails he knew that he was doomed. And so he continued to walk back and forth, shuffling his feet as close to the ground as possible and counting the joints—10 joints one way and then 10 in the opposite direction. But the journeys westward with the icy needles driven through his clothing by the merciless blasts! How difficult they were! And how hard it was to make the necessary 10 rail lengths! Each 33 ft. required a little battle. And each battle seemed a little harder as he drew near the tenth rail-length. But the eastward trip—that was absurdly easy to make. Why, it

hardly required an effort on Ole's part to reach the end of the little trip. All he had to do was to turn around and he was there before he knew it. Several times he felt sure that he had not counted the joints correctly. He knew that he simply couldn't have gone 10 rail-lengths in such a breath of time. And so he added a couple or three—just to make the trips equal, of course.

He wondered what time it was. Surely it must be quite a bit past midnight now. He reached for his watch and then withdrew his hand as he grasped the leather thong that secured the timepiece to his trousers. No! He would not look at the watch. Not yet. Before when he had looked it was only eleven thirty-five. He would wait until he was sure—absolutely sure—that it was at least twelve thirty. Shoving the watch deeper into his pocket he resumed his patrol. Whatever he did he must keep walking, no matter how tired and sleepy he should become. He must remember that—keep walking.

But the joints were becoming more and more difficult to find, the snow burying them deeper and deeper—and Ole wasn't at all sure that he didn't miss a few each trip. Still, he counted them as best he could. Somehow it was becoming harder to keep track of the joints. He must be more careful, too, about keeping between the rails now that the snow was getting so deep. It would be easy to step over one of the rails and out on the limitless prairie. And Ole knew what that would mean. He shuffled along more carefully, keeping his feet as close to the ground as the snow would permit. The westward trip was becoming so much harder to make. To face the fury of the blizzard with its bitter cold blasts, its stinging needles of ice; to drag one's feet along in the snow fearful the while of stepping outside the rails—is it any wonder that Ole dreaded the constant repetition? No. 1, the West Coast Limited, the crack train of the road, was due at Buffalo, the first station east, at one thirty-two. Perhaps it would be safe to drop his head until they were close. This would at least protect his face a little.

His back to the wind, with fingers that were stiff from the cold, Ole again reached for the rawhide thong that was attached to his watch. After fumbling a minute he drew the watch from his pocket. He looked at the dial, holding it close to the ruby sides of the lantern. In the dim rays he could scarcely see it what with his exhalations rising in clouds before his eyes and the snow beating upon the dial. He lifted the watch closer to his face. It could not be possible—yet it was possible—the hands pointed to exactly eleven thirty-five! Then the truth dawned upon him. His watch had stopped and he had no idea of what time it was.

Mechanically, unreasoningly, through force of habit, he wound the useless timepiece and dazedly thrust it back into his pocket. Then he turned and started westward. But wait! Was he on the westward lap? He didn't know. Perhaps it was the eastward lap. Yes, it must be the eastward trip—that was much easier drifting with the storm. He turned again and started eastward.

Surely it must be nearly time for Swenson and the "boys" to be back. The broken rail could not have taken them all this time. Ole stopped and listened to see if he could hear them coming, futile though he realized his action was. Only the rushing blasts of the blizzard fell upon his ears. Quite mechanically he turned and started eastward. He must walk. He must not forget that. His feet and hands were numb and the numbness seemed creeping up his legs and arms. Yes—he must walk. And keep between the rails. Stumbling, he started slowly forward. He had stopped counting the joints for some time past.

And No. 1—they must be due. He must keep his head up from now on. And be ready to swing them down. Suddenly he jerked off his mittens and pulled two more torpedoes from his pocket with his stiffening fingers and with bare hands clumsily attached the lead strips around the ball of the rails. For the thought had suddenly come to Ole that he might have knocked the other two off as he shuffled along his way with his leg crowding the rail as he counted the joints. Then he straightened up and started—eastward. It was so easy to turn eastward. But Swenson—why didn't he come?

The wind wasn't quite so cold now, thought Ole. His hands and feet had been cold—terribly cold. But now they were beginning to get warm. He was so tired and sleepy, though. He felt as if he had walked a hundred miles. If only he could sleep for one little minute. But, no. He put the thought from him, tempting though it was. It would be all right except for No. 1. He could not take a chance on them passing him. The torpedoes were placed, to be sure, but if he was to do his whole duty he must swing them down with his lantern. He spurred himself to a semblance of motion.

After this Ole lost all track of time. He dragged himself through the snow, managing somehow to keep his weary feet between the rails. He made a turn now and then in an effort to remain in the prescribed 10 rail-lengths. Frequently he tripped over his own feet. Now and then he fell down. Each time it was a little harder to get up. If only he didn't have to flag No. 1 he would have gladly lain in the snow and rested a little while. But always he struggled to his feet and resumed his weary way.

His lantern seemed to be getting dim. He held it up close to his face. It was burning very low and even as he watched it it sputtered and went out. Ole held it close to his ear and shook it. Empty! From now on he must walk entirely in the dark. He started on again.

Suddenly he became conscious of a yellow blur of light in the snow ahead of him. It must be No. 1's headlight! Pulling the fusee from his pocket he tore the ribbon from the cap with his teeth and struck the ignition surface of the fusee with the top of the cap. The fusee sputtered into a brilliant red flame. Ole swung it across the track in a wide arc. Why didn't the engineer on No. 1 answer him? To Ole's confused mind it seemed that the yellow blur ahead of him was almost upon him. The engineer had failed to see his signal. With a last despairing swing he hurled the flaming fusee towards the light and fell headlong in his effort to get off the track. He had done his best. The torpedoes—they might save No. 1—but he had failed. Utterly oblivious of everything Ole lay where he had fallen in the snow beside the track. At last he could rest—a little minute. He wearily closed his eyes and was asleep.

* * * * * * *

George Barry, telegraph operator at Buffalo, nodded drowsily as he sat in his chair, his feet elevated to the desk top that filled the little bay window of his office. Before him several instruments at long intervals broke the quietness with their monotone voices. Outside the blasts of the blizzard that was sweeping across the Dakota prairies whistled frigidly and at times shook the frame of the little telegraph office. Ordinarily George would have been in the "hay" at this time—it was nearly four a. m.—but the fact was that No. 1 had not yet passed and he had to wait for them. Due to an engine failure and the storm they were running four hours late, which would make them due at Buffalo at five thirty-two. There were a few extras on the line, but most of them were stuck in sidings or tied up on account of the 16-hour limit.

George did not intend to go to sleep. But inside the office the round body of the lignite burner glowed rosily and the warmth made him drowsy. It was good to be inside where everything was warm and cosy on a night like this and to hear the icy blasts driving the snow across the night-bound plains. And so in spite of George's good intentions his eyes closed. Lower and lower his head dropped until it seemed as if he would fall from his chair. Then with a start he jerked his head to an upright position, lowered his feet and drew his chair closer to the desk. But gradually his eyes grew heavier and heavier; his head again nodded and then dropped upon his arms spread on the desk. And with the full glare of the flame of the lamp falling on his face Morpheus took possession of him. The blizzard howled around the little bay window, but George slept the sleep of the just.

George might have slept until broad daylight had nothing disturbed his slumbers. George was an excellent sleeper. But exactly twenty minutes after he had surrendered to the god of sleep there came a deafening crash and he staggered dazedly to his feet, his eyes struggling to remain open, his brain seeking to grasp what had happened. The desk was covered with broken glass, the wind rushed in through a broken window pane, threatening to extinguish the lamp, and there on the train register sputtered a burning fusee!

It was all so sudden, so unexpected, that for fully a minute George couldn't grasp the situation. Then it came to him that someone must have hurled the fusee through the window—probably some trainman. He picked up the smoking lamp and placing it out of the draft as much as was possible waited expectantly for someone to enter the office and explain. George was angry. To crash a blazing fusee through a window on a night like this was a mighty queer way to be funny, he thought. He would tell the thrower exactly what he thought of him in no uncertain words. Outside the blizzard continued with unabated fury. Inside the office the thermometer rapidly descended. The sulphurous fumes of the fusee began to fill the room as it blazed on the scorching train register. Rushing to the desk George seized both register and fusee and, lifting the cover of the stove, dropped them in.

He was now fully awake and hastily lighting a lantern he slipped into his overcoat, mittens and overshoes and, opening the door, prepared to investigate the wherefore of the burning fusee. The feeble rays of the lantern scarcely penetrated the storm and it is doubtful that George would have found who threw the fusee had he not stumbled over a prostrate body in the snow beside the track. He bent low, holding the lantern close to the man's face and brushed aside the snow that covered him. "Ole Larsen—one of Swenson's men!" he said to himself in astonishment. Grasping Ole around the shoulders he half carried, half dragged him into the little freight room, where it was cold but sheltered, and hastily scooping up a wash basin full of snow he began to briskly rub the trackman's hands and face with it. "Wonder how in the world he got here," thought George. Removing Ole's shoes and socks, he applied the snow to his frozen feet.

Back in the shelter of the little station at Wheatland, Swenson was wondering where Ole was, too. He had put in the new rail and then walked back to the place where he had posted Larsen to flag. To run the car had been impossible. But when he arrived at the spot where he had left Ole there was no one to be found. So after searching vainly for him Swenson and his men had returned to the empty little depot at Wheatland a half mile back, built a fire in the stove, and while they waited for daylight to come speculated on what had become of Ole. They hoped he was safe, but they feared for him.

But their fears were groundless, for Ole, due to George's ministerings, was rapidly returning to normal. "Ay don't know how Ay came here, George," he said in answer to the operator's question. Ole leaned back against the boarded side of the freight room—he dared not go into the office yet. The lantern placed on a dry goods box shed a dim light on the two men. George was still rubbing Ole's hands and feet with snow. Little drifts on the floor marked the places where cracks allowed the flakes to enter. "Swenson, he tell me hold everything while he change out rail," continued Ole after a minute. "Ay bane put torpedoes and vauk back and fort on track, but maybe —maybe Ay valk farther ven Ay bane came east with vind than ven Ay turn and valk odder vay. Yes—Ay tank that vas it—and ven Ay see No. 1 coming close Ay try stop him with fusee, but enyineer he didn't see me. So Ay throw fusee at the headlight and yump quick!"

George laughed. "The headlight you thought you saw was the lamp in my office window, Ole. You sure made a bull's eye, too. No, 1 won't be here for nearly half an hour yet," he added.

A happy smile spread over Ole's face. "No. 1 ain't bane come by yet?" he asked.

"No—not yet."

"Ay bane glad," said Ole. "Ay vonder where Swenson and boys are."

And closing his eyes contentedly, Ole dropped to sleep.

DROPS OF WATER MEAN DOLLARS

WATER IS SUCH a common and well-known substance that it is hard for the average man to realize that, like all other things on a railroad, it costs money. The following article by A. B. Pierce, engineer of water supply, Southern Railway, published in a recent issue of the "Southern News Bulletin," brings this out in a pointed and concise manner:

That water is necessary and plays an important part in the operation of a steam railroad is generally conceded, but where it comes from, how much is required or what it costs delivered directly to the tenders and other outlets are important details given but little concern or consideration by the average railroad employee. For example, the writer, while watching a railroad storage tank overflowing at the rate of 250 gal. per minute, remarked to a nearby employee, "What an enormous waste of water we have over there." In all seriousness he replied, "Oh, no; can't you see that it is all flowing right back into the stream where we got it?"

A railroad employee, while on an inspection, noted a $1.50 hammer lying carelessly on the ground rusting; he passed it, ducked under an overflowing storage tank, went to the station washroom where three outlets were running 365 days in the year, and after reaching his office sent a sound letter of criticism to the party responsible for the carelessness in handling tools, but no mention whatever was made concerning the enormous water waste.

Water is not free and should be used most economically at all times, as the following figures will bear out: The Southern uses, by careful investigation of each station, 45,500,000 gal. of water per day of 24 hr., at a cost of over $1,660,000 per year. This consumption is furnished by 350 pumping plants, 60 gravity stations and 121 city supply stations, making a total of 531 water stations. It has been conservatively estimated that the average railroad wastes 15 per cent of the total amount of water used—that is, 15 per cent more water is used than is actually needed to meet requirements.

If all employees would bear this in mind, start a campaign against water waste and reduce this percentage of

loss from 15 per cent to, say, 7 per cent, we would save $132,000 per year. This saving could be accomplished by reducing losses from overflowing tanks, tenders, faucets, coach yard outlets, water columns, pipe lines, hydrants, toilets, etc. To illustrate: Ten defective outlets running 365 days at 3 gal. per min. (and there are many such cases) register a loss of over $1,500 per year.

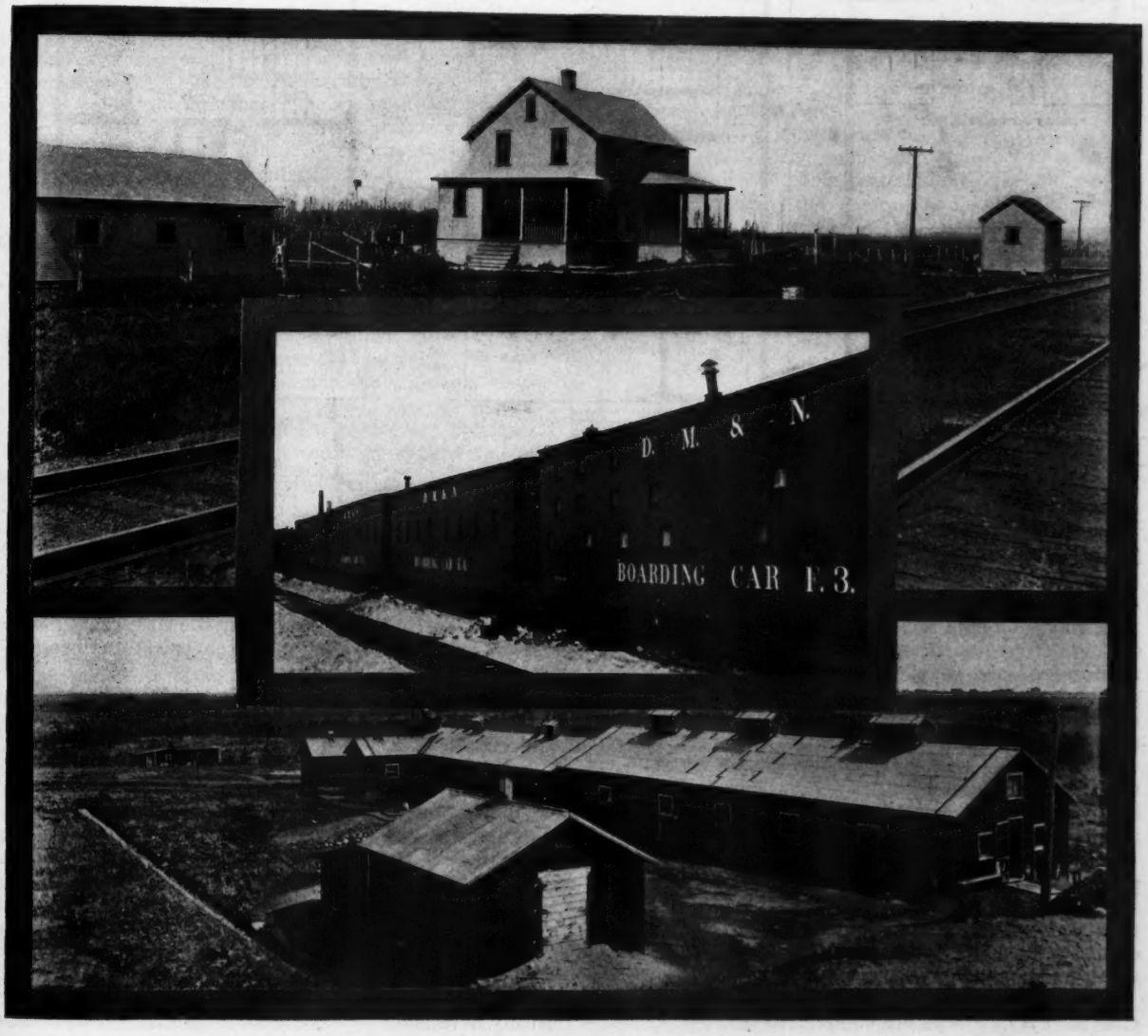
Is it not worth while to give this matter your serious consideration? Special attention is particularly requested at this time, due to the ever-increasing cost to furnish or purchase water for all purposes. We cannot stop the rise in price, but we can be careful and economical in its use by acquiring the habit of reducing water waste and the realization that it is not free.

Improving Quarters for Maintenance Forces

BY F. C. BALUSS,
Engineer of Bridges, Duluth, Missabe & Northern, Duluth, Minn.

SHORTLY AFTER the Duluth, Missabe & Northern was acquired by the United States Steel Corporation, the maintenance officers of this road, recognizing the benefits to be derived from better housing of maintenance of way men, and in furtherance of the policy of the corporation, began to raise the standard of living of this class of railroad workers. As a consequence a great improvement has been effected in the character of the quarters provided for the section foremen and track laborers.

This road is one of the ore carriers bringing iron ore from the Missabe iron range to the ore docks at Duluth.

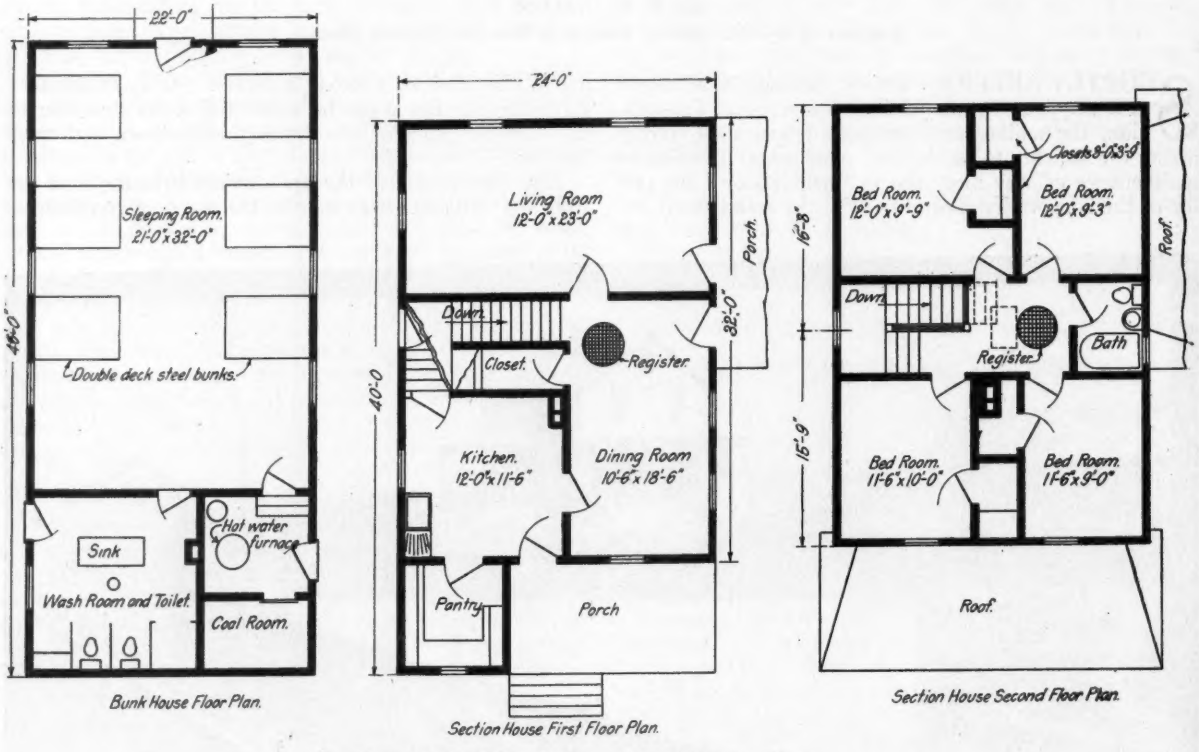


Quarters for Maintenance Forces on the D. M. & N.

Above—New Standard Bunk Section and Tool Houses. Center—Bunk and Boarding Cars. Below—The Hull-Rust Camps.

Its iron ore tonnage is approximately one-third of all the ore mined in the Lake Superior region and greatly exceeds that of any other railroad. The season for shipping ore begins about May 1 and ends about December 1, being therefore about seven months in duration. During the remaining five months of the year the traffic is comparatively light, but due to the frost and snow very little can be done in the way of maintenance and this work becomes practically coincident with the period of very heavy ore traffic. From this the necessity and importance of being able to recruit quickly and hold large crews of men for maintenance work is seen.

The present standard for section houses of this railroad is 26 ft. by 30 ft. in size, with concrete basement and furnace heat and contains seven rooms. A large pantry with cupboards is provided off the kitchen and each sleeping room has a closet. Practically every section house has a separate bunk house for the men equipped with individual clothes lockers for each man. When there is a suitable water supply, both the section house and bunk house are equipped with bath tubs or showers.



Plans of the Improved Bunk and Section Houses

In the earlier years of the railroad, the men were lodged in the section houses. These buildings were of frame construction, 14 ft. by 28 ft. and 14 by. 14 ft. in size, without basements, two stories in height, with three rooms on each floor. These rooms were absolutely destitute of conveniences, no closets for clothing, or pantry for food and supplies or even a kitchen sink being provided. The inside walls were ceiled, and as this material shrunk from weathering, cracks were opened and the houses became very difficult to heat in the severe weather of this latitude, especially as only stoves were used for this purpose. Likewise in summer, the houses, being as poorly insulated from heat as from cold, became very warm and uncomfortable.

It was not unusual to house as many as 16 or even 20 persons in these buildings. With these conditions, only the poorest class of men could be secured. The labor turnover was very high and it became exceedingly difficult to secure good foremen who would consent to live with their families under such conditions.

The first attempt to provide better housing was by the construction of a separate building for sleeping quarters for the men, and while the men were served their meals in the section house, otherwise it was for the exclusive use of the section foreman and his family. The results from this, in the way of obtaining more contented men, were so very gratifying that still further improvements were made.

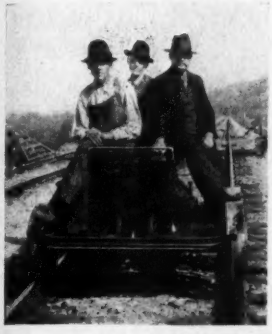
Extra gang men, who are being moved about over the road, are housed in large, roomy boarding cars built especially for their use instead of the old, worn out box cars familiar on many roads. Whenever the work to be done is extensive enough to justify the cost, camp buildings are erected, providing more convenient and commodious quarters for the men.

COLOR OF CYPRESS HEARTWOOD NO TEST.—Southern bald cypress is about the most variable in color of any of our native woods, and in different localities is known as red cypress, yellow cypress, white cypress and black cypress. There is a rather prevalent belief that cypress with dark-colored heartwood is the most durable, but the opinion of the U. S. Forest Products Laboratory is that as far as durability is concerned the color of the wood makes very little difference. In service records obtained by the laboratory, any difference in the length of service to red cypress and yellow cypress appears to be due entirely to a difference in the amount of sapwood in the timbers. Cypress trees with light-colored heartwood usually have more sapwood than those with dark-colored heartwood, and sapwood is not resistant to decay. The important thing if durability is desired appears to be to select the heartwood of cypress regardless of its shade.

MAINTENANCE OF WAY AND MOTOR CAR ACCIDENTS*

Restrictions on Speed, Protection Against Trains and Consistent Educational Campaign are Most Effective Remedies

BY ARTHUR RIDGWAY,
Assistant Chief Engineer, Denver & Rio Grande, Denver, Colo.



RELIABLE figures show conclusively that the per cent injured among the maintenance of way forces is considerably lower than among railway employees as a whole. For example, a record of two years shows an average of 26 per cent less injuries per 100 men employed in this department than the average of all the railroad forces combined. Again, the same two-year period shows that in the maintenance of way forces there were 62 per cent less injuries per 100 men employed, or less than half as many, as among all the other so-called unskilled railroad laborers. While this statement is not indicative of the relative immunity from injury of railway maintenance of way forces as compared with other industrial pursuits, it does show that in so far as railway employees as a whole are involved, the maintenance of way man is decidedly less likely to be injured than the average railroad worker.

To be of any practical value, an analysis of the subject under discussion would seem to demand a segregation of motor car accidents from other kinds in the maintenance of way department. Comparing the two general classes, we find that motor car accidents comprise about 14 per cent of the total, and all others, therefore, about 86 per cent. The motor car accidents may be conveniently grouped into four typical classes and their respective frequency compared thus:

Collisions with trains	37 per cent
Men falling off cars	32 per cent
Derailments	26 per cent
Collisions with other cars	5 per cent

An analysis of these four groups leads to the assignment of primary contributory causes as follows:

Collisions with trains—Speed and carelessness.
Men falling off cars—Speed, carelessness, and limitations in the design of cars.
Derailments—Speed, carelessness, and limitations in the design of cars.
Collisions with other motor cars—Speed.

There are thus shown to be three principal contributing factors, of which one, speed, is common to all four groups. Perhaps excessive speed in the use of cars can be very largely, if not entirely, attributed to that human instinct common to all mankind which may be described as an almost uncontrollable passion to utilize to the utmost all power and authority vested in the individual. For instance, if a man is given the power of propulsion to travel without inconvenience 30 miles per hour, he will never move at less velocity. The case of the automobile is an illustrious example.

As to the limitations in the design of cars, much may be said. Lightness is the first requisite, for to be of any use at all workmen's cars must be so limited in weight as to be easily handled on and off the track by the number of men they are designed to carry. On the other hand, this very limitation in weight militates against immunity from derailment, since many derailments may be ascribed to light weight as a contributing cause. Again, limitation in weight is inseparable from restricted dimensions which necessarily curtail seating and tool-carrying capacity, both in magnitude and distribution, throughout the space available therefor. In fulfilling the fundamental essentials, the designer is also handicapped in properly disposing of the matter of hand holds and grabirons, while provisions for the various forms of tools, separate and apart from their weight, is indeed a serious study. Moreover, the adoption of either the direct or indirect method of drive carries with it a sacrifice of some to the advantage of the other.

The carelessness factor in most motor car accidents is manifested in disorderly seating of men, hasty and thoughtless loading of tools, inattention to car and contents while under way, and wanton disregard of the danger of imperfect flag protection.

OTHER MAINTENANCE OF WAY ACCIDENTS

Turning now to a consideration of other maintenance of way accidents in distinction from those attendant upon the use of motor cars, we find the most frequently recurring accidents, listed in their order of frequency, to be as follows:

Struck by flying objects.
Use of tools not defective.
Eye injuries.
Struck by falling objects.
Use of tools in hands of others.

Among the flying objects which carry destruction in their path may be mentioned spikes not firmly started before a full swing blow of the maul is delivered, nuts cut off track bolts with a chisel or knocked off with a maul, and articles thrown or falling off passing trains. The unskilled use of non-defective tools, such as picks, claw bars, shovels, adzes and track jacks, contributes a very large share of resultant injuries. Eye injuries originate largely from mushroomed chisel heads, improperly tempered cutting edges, dust and metal scale. Many of the injuries resulting from falling objects are incurred during the loading, unloading or other handling of materials of one sort or another. The erratic swinging of picks and mauls and the careless manipulation of shovels are responsible for a very considerable number of injuries inflicted by tools in the hands of others.

Of all the injuries suffered by maintenance of way employees, more than one-third—35.6 per cent, to be exact—are to be found in injured hands and feet, in the proportion of about two in the hands to each one in the feet. A most prolific source of injury to the fingers is in the use of the claw bar when pulling inside spikes. Perhaps the claw is worn and the foreman hasn't taken the trouble or had time to send the bar in for reforming; or perhaps the workman does not use care in getting a good bite on the spike; or perchance the spike head is

*Abstracted from a paper read before the annual meeting of the National Safety Council at Milwaukee, Wis.

on the opposite rail with only a human finger to absorb the impact. Another deep-rooted origin of injury to the hands is to be observed in the many slivers, jagged edges and rough surfaces with which maintenance of way materials abound. Again, maintenance of way materials are of necessity weighty and large in size. Stored in piles or nested in transportation, they present no opsnapped off, but whatever the reason, a wild hard pull often sends the handle end of the bar crashing down portunity for a hand hold. The slightest opening between units serves as an invitation to a workman to thrust in his hand and the outcome is often a crushed finger.

Occasionally a man cuts his foot with an adze or strikes it a glancing blow with a maul, but by far the majority of foot injuries occur through the dropping of some heavy object on the toes. Very often this is the result of some spontaneous action of one or more of his co-workers without advance warning. In the handling of railroad materials, the units of which require the combined effort of two or more men, lack of unity of action or movement is almost sure to result in some sort of accident.

CONCLUSION

A conclusion without a discussion of remedies would be reprehensible. The only absolute cure for excessive speed in the use of motor cars is to render high speed impossible in the design of cars, and notwithstanding the disadvantage of limiting the speed of all cars to a predetermined rate, safety interests apparently demand such limitation. Thorough co-operation with manufacturers of cars in the details of design will accomplish much towards a universally satisfactory type of car, and it will surely open a way for a judicious choice of the lesser of any two evils of design.

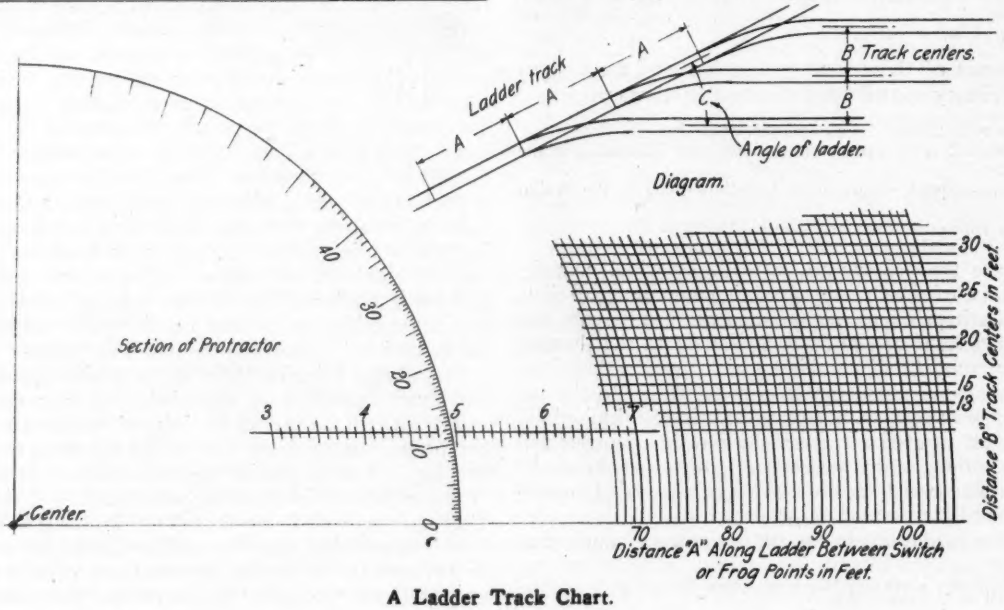
There is but one wholly effective remedy for curing the most pernicious practice of moving motor cars without flag protection, and that is to require such movements to be conducted under the standard train order system. We are forced to the conclusion, however, that because of the delicate questions involved, this plan is impossible of adoption and that there remains the only alternative of enforcing a rigid requirement of adequate flag protection. To accomplish the desired results, this requirement must be exacted under the most stringent discipline and even trivial violations thereof subjected to extremely careful scrutiny. Perhaps there is no more effective means to the end sought than in justifying these severe disciplinary measures by emphasizing without stint the constantly impending danger involved in unprotected car movement. The unsystematic loading of men and tools, primarily due to simple thoughtlessness, can generally be eliminated by patient and specific admonition.

The most potent instrument in combating the persistent menace of other maintenance of way accidents is available in the form of a prudently administered campaign of education; in fact, it is about the only recourse. There is in this suggestion no intended implication that these men of brawn are necessarily of inferior mentality, for no one human is superior to any other outside their respective spheres of mental activity. It means simply that thus far no educational opportunities have been available. Briefly stated, they have never been told.

A GRAPHICAL CHART FOR USE IN DESIGNING YARD LAYOUTS

A CHART, which is self-explanatory, for the use of draftsmen and others engaged in the preparation of railway yard and terminal plans from which information of sufficient accuracy to save a considerable amount of calculation is readily available, has been developed by A. H. Jones, assistant engineer on the Canadian National Railways, Moncton, N. B. As may be seen on examination, the chart makes possible a graphical determination of the maximum angle (C) which a ladder track can make with the tracks in the body of a yard.

To use the chart it is only necessary to place a straight-edge from the point of intersection of the horizontal line indicating the distance (B) between track centers and the curved line indicating the distance (A) required between the switch or frog points measured along the ladder track, to the center of the protractor. The angle indicated is the angle required. The spread of the ladder track with the body tracks in units of length in which the spread is one, is also indicated on the horizontal scale. Conversely, with the angle between the ladder and body tracks and the distance between frog or switch points known the distance be-

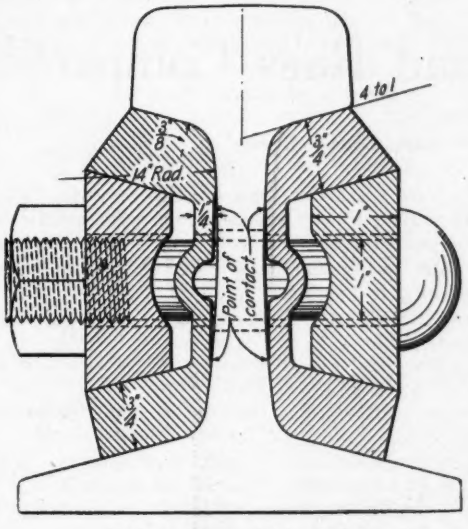


A Ladder Track Chart.

tween centers of the tracks in the body of the yard will be indicated. Also with the angle between the ladder and body tracks and the track centers known the distance between frog or switch points will be indicated.

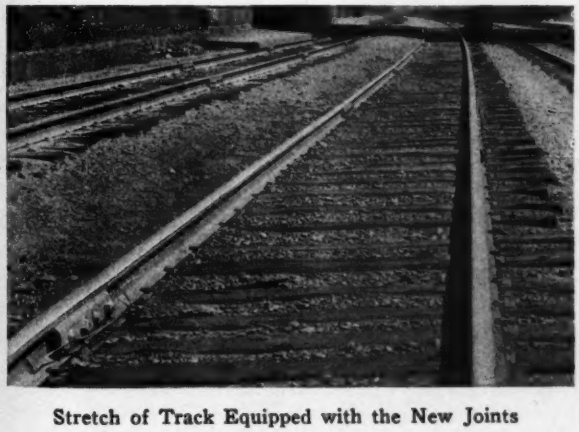
A NEW RAIL JOINT

ONE OF THE recent developments in railway track appliances is a rail joint that has been in service on the Boston & Albany for almost three years. The splice bars forming this joint are in two parts, the outer or channel-shaped part which engages the fishing surfaces of the rail and a small bar designed to fit the secondary fishing surfaces on the larger bar. The larger or channel-shaped bar is made with a relatively thin web, which is



Section Through the Joint

curved, as shown in the drawing, to afford considerable resilience for the purpose of spreading the two flanges of the bar apart, as may be necessary to obtain the proper adjustment of the fit against the fishing surfaces of the rail and to take up such wear as occurs in these contact



Stretch of Track Equipped with the New Joints

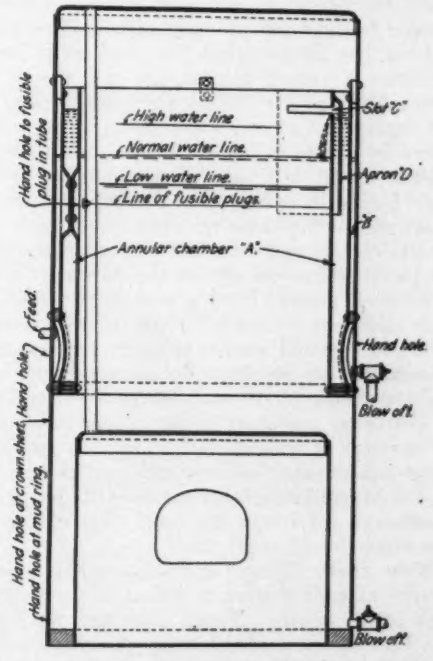
surfaces. The agency for accomplishing this adjustment of fit is provided by the smaller bars of the joint which, when forced together by tightening up the bolts, serve to force the channel-shaped bars into a snug fit, not only against the fishing surfaces of the rail, but also against a considerable portion of the web. Another feature to which attention is drawn by the manufacturers of this splice is that portions of this joint, such as the inner bars, may be renewed independently of the rest of the joint, thereby effecting a considerable saving. Besides the installation of these rail joints on the Boston & Albany, some nine other roads have arranged to undertake similar tests.

This rail joint has been placed on the market by the American Rail Joint Company, 141 Broadway, New York City.

A SCALE-PROOF LOCOMOTIVE CRANE BOILER

FOR MANY USERS of locomotive cranes the largest single item of upkeep expense is the washing and maintenance work on the boiler. At best there is no ideal boiler feed water and often locomotive cranes, working in sections more or less remote from a supply of purified water, are forced to use a poor supply. To meet this condition, the Industrial Works, Bay City, Mich., has built a new patented locomotive crane boiler equipped with an annular scale chamber placed between the tubes and the shell plate.

In this boiler, the feed water is slowly passed through this scale chamber (at about 1/200 of the speed through



Vertical Section of the Boiler

the intake pipe) and attains a temperature at which the scale-forming impurities will be liberated from solution without the use of any chemicals. The impurities are then carried in suspension and as the movement of the water is very slow these suspended precipitates settle down readily to the bottom of this chamber. This settling is accelerated by the decrease in its fluid friction.

The purifier consists of the annular scale chamber "A" extending completely around the tubes, with a one-inch water space "B" between this chamber and the boiler shell. The outlet into the main portion of the boiler is the slot "C," guarded by the apron "D." The feed water is admitted directly to the scale chamber "A" at a point farthest from the outlet slot. It then travels slowly around this chamber to the outlet, the apron "D" keeping

any floating impurities, such as grease, oil, etc., from being discharged into the main boiler.

The sulphates of calcium are the hardest of the scale-forming impurities to get rid of. They are precipitated at 280 deg. F., corresponding to boiler temperature when holding steam at only 35-lb. gage pressure. The carbonates and magnesia are precipitated at lower temperatures. These are all caught in the scale chamber together with mud, oil, and, in fact, all solids except common salt, for the first application of heat is what causes the liberation of these solids. The impurities left in the scale chamber do not bake into scale, as they do not come into contact with the hot furnace sheets, but are left as a soft mud which may be readily blown or washed out.

In a test of a 42-in. diameter boiler of this type, feed water naturally carrying 5 grains per gallon was loaded with 70 grains of calcium and 70 grains of earth, a total of 145 grains per gallon. The feed was taken from a barrel agitated with carbonic acid gas to form calcium carbonate. After about 1,200 gallons of this kind of water had been passed through the boiler it was allowed to cool. The heating surfaces and the lower mud ring were found to be perfectly clean, with mud about six inches deep in the scale chamber. The blow-offs were both plugged so all impurities remained in the boiler. It was interesting to note that the presence of so much precipitated impurity in the scale chamber did not interfere with its operation.

Shallow-head and Deep-head Rails Compared

BY GEORGE H. TINKER,
Bridge Engineer, New York, Chicago & St. Louis, Cleveland, Ohio

IT HAS BEEN contended that the shallow-head rails are not suitable for rail-built crossings. The impact of the wheels upon the point of the crossing frog as they jump the flangeway produces a very severe strain which might be expected to cause early failure by shearing the head, but on one trunk line road it has been possible to make a record to test out this theory, which shows no advantage for the deeper head sections.

Exact duplication of conditions affecting wear of rails can rarely be found. Two pieces of track, especially on different roads, will vary as to conditions of grade, curvature, ballast or traffic. Two pieces of track on the same road and in the same territory might have characteristics closely enough alike for the purposes of comparative records; but, except for the purposes of experiment, two such pieces of track ordinarily would not be laid with different sections of rail in the same year. Moreover, there would need to be many such experiments to obtain conclusive results. But at a railroad crossing some of the elements of uncertainty are largely eliminated. Crossings are short lived, in many instances requiring renewal at intervals of a year or less. Track conditions will remain the same, and, under normal conditions, volume and weight of traffic will change slowly. Also, crossings are frequently built of a section of rail different from the adjacent track.

The New York, Chicago & St. Louis has a record of rail service extending over a period of 7 years for 45 crossings at 18 points. These crossings were built of 85-lb. A.R.A. type A rail, having a shallow head, and later of 90-lb. A.S.C.E. rail, having a deeper head.

TABLE 1—PROPERTIES

Section	Height	Depth of head	Section Modulus Head	Base	Per Cent of Area Head	Web	Base
85 AS	5 3/16	1 35/64	11.1	12.0	42.0	21.0	37.0
85 RA	5 3/8	1 29/64	11.4	13.8	37.0	22.8	40.2
90 AS	5 3/8	1 19/32	12.2	13.3	42.0	21.0	37.0
90 RA	5 5/8	1 15/32	12.5	15.2	36.2	24.0	39.8
90 RB	5 17/64	1 39/64	11.5	13.2	40.1	19.2	40.7
100 AS	5 3/4	1 45/64	14.6	16.1	42.0	21.0	37.0
100 RA	6	1 9/16	15.1	17.8	36.9	23.4	39.7
100 RB	5 41/64	1 45/64	13.7	15.7	40.2	19.2	40.6

Table 1 shows some of the elements of these and other deep-head and shallow-head rails. AS signifies American Society Civil Engineers' section, RA signifies American Railway Association, type "A," and RB, American Railway Association, type "B." It will be noticed that for the same weight of rail, RA sections are higher and RB sections are lower than the AS sections. The RB and AS rails are deep-head sections with practically the same depth of head, while RA rails have a shallower head. The section modulus, both head and base, follows the variation in height.

The detailed record of service for the crossings is shown in Table 2:

TABLE 2—SERVICE RECORD OF ROLLED RAIL CROSSINGS

Crossing	Rail	Steel	Installed Mo.-Yr.	85 RA Yrs.	85 RA Mos.	90 AS Yrs.	90 AS Mos.	
1	85 RA	Bessemer	12-13	3	3			
2	90 AS	open hearth	3-17			1	0	
3	90 AS	manganese	3-18					
4	85 RA	Bessemer	12-13	3	4			
5	90 AS	manganese	4-17					
6	85 RA	Bessemer	10-13	1	2			
7	90 AS	manganese	12-14					
8	90 AS	open hearth	3-19			1	8	In service
9	85 RA	Bessemer	1-14	1	9			
10	90 AS	Bessemer	10-15			2	9	
	90 RA	manganese	7-18					
11	85 RA	Bessemer	1-14	1	6			
12	90 AS	manganese	7-15					
	100 RB	manganese	3-20					
13	85 RA	Bessemer	4-13	5	6			
14	90 AS	open hearth	10-18			2	1	In service
15	85 RA	open hearth	9-13	5	2			
16	90 AS	open hearth	11-18			2	0	In service
17	85 RA	open hearth	9-13	7	2			In service
18	85 RA	open hearth	9-13	7	2			In service
19	85 RA	Bessemer	11-13	1	6			
20	90 AS	Bessemer	5-15			3	5	
21	90 AS	open hearth	10-18			1	7	
	90 RA	open hearth	5-20					
22	85 RA	Bessemer	2-14	1	1			
23	90 AS	Bessemer	3-15			2	2	
24	90 AS	open hearth	5-17			1	6	
	100 RB	manganese	11-18					
25	85 RA	Bessemer	1-14	3	6			
26	90 AS	open hearth	7-17			1	3	
27	90 AS	open hearth	10-18			1	9	
	90 RA	open hearth	7-20					
28	85 RA	open hearth	7-13	2	7			
29	90 AS	manganese	2-16					
	100 RB	manganese	8-19					
30	85 RA	manganese	9-13					
31	90 AS	open hearth	3-16			3	0	
32	90 AS	open hearth	3-19			1	8	In service
33	85 RA	Bessemer	2-14	0	9			
34	90 AS	manganese	11-14					
35	90 AS	manganese	3-19					

Crossing	Rail	Steel	Installed Mo.-Yr.	85 RA Yrs.	85 RA Mos.	90 AS Yrs.	90 AS Mos.	
36	85 RA	Bessemer	11-13	1	9			
37	90 AS	Bessemer	8-15			1	7	
38	90 AS	open hearth	3-17			2	1	
39	90 AS	manganese	4-19					
40	85 RA	Bessemer	11-13	1	9			
41	90 AS	Bessemer	8-15			1	7	
42	90 AS	open hearth	3-17			3	8	In service
	90 RA	manganese						Ordered
43	85 RA	Bessemer	11-13	1	9			
44	90 AS	open hearth	8-15			1	7	
45	90 AS	manganese	3-17					

The record has been interrupted in several cases by the substitution of manganese crossings for carbon steel. In two instances the 85 RA crossings are still in service after a life of over seven years. In five cases the 90 AS crossings are still in service with a life of from 1 year, 8 months to 3 years, 8 months. At 9 points, involving 9 85 RA crossings and 13 90 AS crossings, completed comparative records of carbon steel crossings may be made, namely:

Crossings Nos. 1 and 2.
Crossings Nos. 9 and 10.
Crossings Nos. 19, 20 and 21.
Crossings Nos. 22, 23 and 24.
Crossings Nos. 25, 26 and 27.
Crossings Nos. 30 and 31.
Crossings Nos. 36, 37 and 38.
Crossings Nos. 40 and 41.
Crossings Nos. 43 and 44.

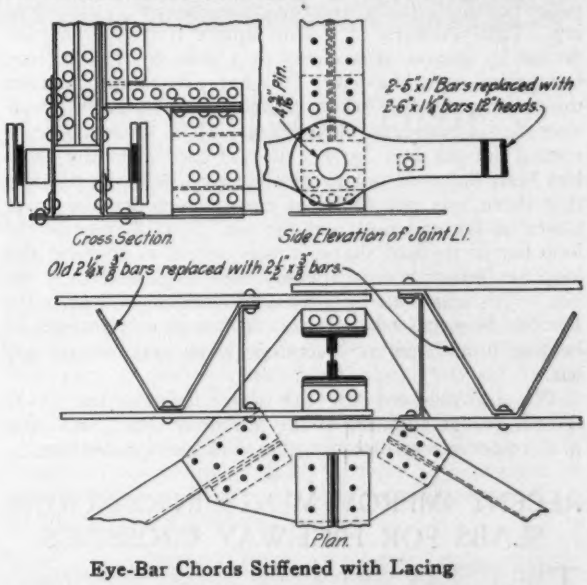
Of the 13 comparative records here possible, 6 show a longer life for the 85-lb. RA rail, varying from 2 months to 2 years, 3 months, average 13½ months; 7 show a longer life for the 90-lb. AS rail, from 1 month to 1 year, 11 months, average 9 1/7 months; the shallow-head rails showing an average longer life than the deep-head rails of 4 months. While the scope of the investigation is too restricted to warrant positive conclusions, the negative conclusion is clear; for rail-built crossings the deep-head rail has not shown any superiority over the shallow-head rail.

REPLACING THE EYE-BARS ON A TRUSS SPAN

A HIGH degree of ingenuity has been exercised for so many years in the repair and strengthening of metal bridges that it would appear that every conceivable means of reinforcing the ordinary type of structures has been carried out at some time or other. Compression members have been reinforced, floor systems have been strengthened or replaced, counters and other diagonal members are often amplified by additional members, but it is not often that eye-bar bottom chords require strengthening. However, this is exactly what has been done on the Luxapalila Creek bridge on the Mobile & Ohio during the past year when this structure was given a general overhauling.

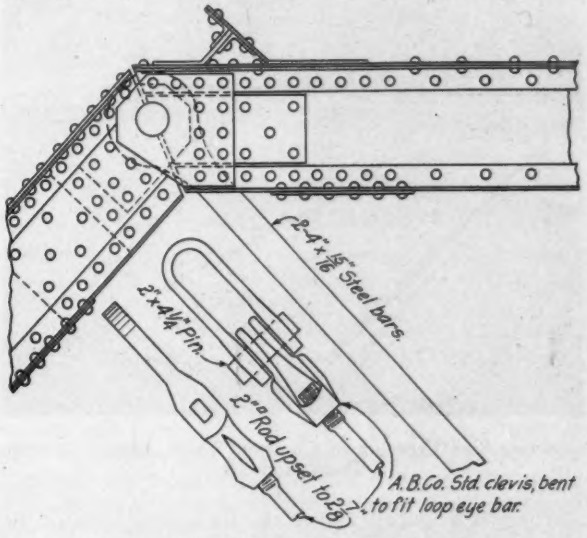
This bridge consists of a single-track, through, Pratt truss span, 120 ft. long, center to center of end pins. It is composed of five panels of 24 ft. each and was built by the Edgemoor Bridge Works in 1897. Recent analysis of this structure for modern loadings disclosed weakness in the main diagonals of the second panel and in the diagonals or counters of the middle panel, as well as in the entire bottom chord. The latter is composed of eye-bars, two to each panel, and placed outside of the posts. In the center panel these were 5-in. by 1¼-in. bars with 11½-in. diameter heads. In all the other panels they were 5-in. by 1-in. bars with 11½-in. heads and all the bars except those in the center panel were latticed with 2¼-in. by ⅜-in. bent bars.

The bars in the center panel were replaced by 6-in. by 1¾-in. bars and those in the other panels by 6-in. by 1¼-in. bars, the bars in the first and second panels being stiffened to take moderate compressive stresses by the use of bent lattice bars similar to those on the bars that


4⅞" Pin.
2-5"x1" Bars replaced with 2-6"x1¼" bars 12" heads.
Cross Section.
Side Elevation of Joint L1.
Old 2½"x⅜" bars replaced with 2½"x⅜" bars.
Plan.

Eye-Bar Chords Stiffened with Lacing

were replaced. Owing to the limited clearance it was necessary that the new eye-bars have special heads of less diameter than standard heads, but because the pins are smaller than those ordinarily used with the size of bars required, there was ample metal in the net sections through the heads. The pins were found to be in excellent condition and in consequence it was decided that it



How the Diagonal Was Reinforced

was unnecessary to remove them, even though the calculated stresses were somewhat above usual limits.

The bottom chord eye-bars were renewed one at a time between trains. To do this the strain was taken off the bars by drawing the pins toward each other with the aid of cable slings and pulling jacks. First the outside bar was taken off and replaced by a new one and then the operation was repeated for the inside bar. Pilot points

were placed on the ends of the old pins and the changes were made with no particular difficulty. It was necessary to heat the heads of some of the new bars to avoid excessive ramming, this being done with fusees. After the complete change had been made on one truss the operation was repeated on the other truss.

The reinforcement of the diagonals for the second panel required special treatment, as shown in the drawing. This consisted of a 2-in. square rod upset and attached by means of a clevis to a 2-in. by 1½-in. loop bar passed over the pin. This bar was placed between the existing eye-bars where there was not sufficient clearance for a standard clevis pin. As a consequence, a special flat pin 2 in. by 4½ in. was used after the clevis had been flattened out to receive it. Owing to the fact that there was not sufficient clearance under the cover plates of the end post and the top chord to receive the loop bar in its final shape, it was necessary to bend this loop bar into a bow shape in order to pass it over the pin. This was done by a local blacksmith, and after the bar has been passed over the pin it was straightened by heating it with an oxy-acetylene torch and using a pry bar.

We are indebted for the above information to H. Austill, bridge engineer of the Mobile & Ohio, St. Louis, Mo., under whose direction the work was carried out.

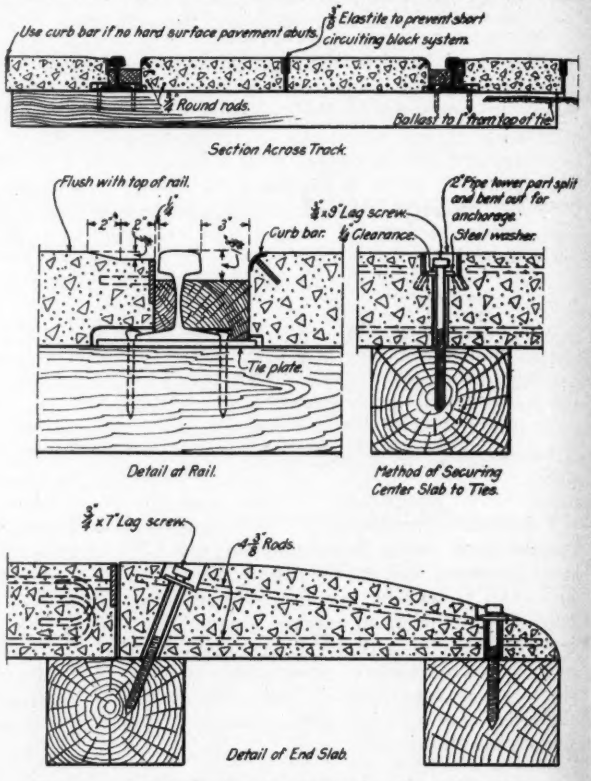
RECENT IMPROVEMENTS IN CONCRETE SLABS FOR HIGHWAY CROSSINGS

THE USE OF concrete slabs in highway crossings is again brought to attention by a recent installation on the Illinois Central at Champaign, Ill., and one on the Michigan Central at Jackson, Mich. Earlier use of concrete in the form of slabs or planks in highway crossings on the Chicago, Milwaukee & St. Paul and the Chicago,

Concrete Slab Crossing at Chestnut Street, Illinois Central, Champaign, Ill.

Burlington & Quincy and at the Buffington plant of the Universal Portland Cement Company, were described in the *Railway Maintenance Engineer* for March, 1918, page 111. After several years of careful study of these slabs, particularly at the Universal plant, it was deemed advisable to make some strength tests of such slabs, which were recently completed at the University of Illinois. Among other facts established by the experiments was that web reinforcement did not add any strength to the slabs so the expense of this reinforcement may be saved. The tests also indicated that it would require a load of 30 tons on one wheel to crush through the concrete slab where a 22-in. spacing of track ties is used.

The new installations on the Illinois Central and the Michigan Central were constructed in accordance with the results obtained in these tests. They were precast and rest directly on the ties. There are two lines of slabs 5 ft. 6 in. long and 25 in. wide between the rails. The slabs outside the rails are of the same length and 18 in. wide. The edges of the concrete slabs are protected by a metal band ¼ in. thick and where there is unusual wear



Recommended Design for Concrete Crossing Slabs

Kahn curb bars are provided. Each slab has two rectangular holes serving as sockets for the lifting pins. As none of the slabs in these crossings weigh over 800 lb.—which is lighter than a 33-ft. 80-lb. rail—they can easily be removed and replaced. These facilities for lifting out slabs make it a simple matter to do any track work within the limits of the crossing.

As shown in the photograph, beveled ramps are cast on the ends of the slabs between and outside the rails at each end of the crossing to eliminate the danger of tearing them up by dragging parts on a moving train. In the older designs these ramps were generally made of steel plates and wood. Precautions have been taken to prevent the possibility of creeping or heaving by fastening each slab to the ties with ¾-in. by 9-in. lag screws. It is important to space the ties at regular intervals so that the ends of the slabs can be well supported. As the railroads use varying tie spaces, a general rule for the length of each slab is three times the tie spacing. At Jackson, Mich., an interesting feature of the installation was the use of an oak filler to form the flangeway instead of providing a guard rail.

The work at Champaign, Ill., was carried out by H. C. Hayes, assistant engineer, and J. J. Sekinger, supervisor of bridges and buildings, on the Illinois Central. The work at Jackson, Mich., was under the direction of W. O. Houston, division engineer, Michigan Central.

Wood Preservers at San Francisco

WOOD-PRESERVERS STUDY WESTERN TIMBER

Convention in San Francisco Affords Opportunity to Observe Forest Resources of Pacific Coast

THE SEVENTEENTH annual convention of the American Wood-Preservers' Association was held at the St. Francis hotel, San Francisco, Cal., on January 25-27, inclusive, with over 125 members and guests present. The meeting was characterized particularly by the interest displayed in western timbers, their methods of production and of treatment. A party of 65 members and their families left Chicago on January 14 and spent a week visiting saw mills and logging camps in Oregon and Washington prior to the convention, securing first-hand information concerning the western timbers which are now coming into increasing use on eastern roads.

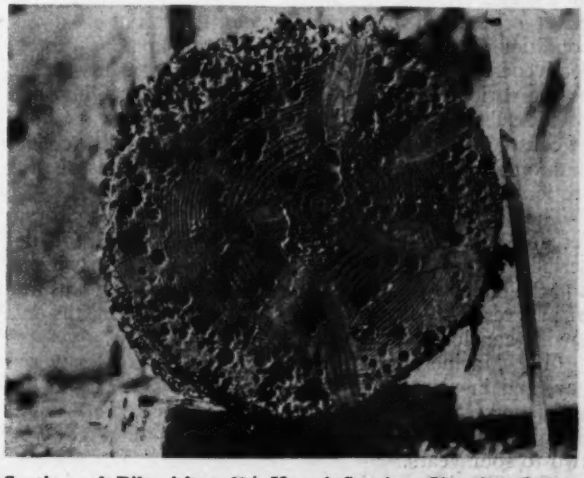
The officers of the Wood Preservers' Association for the past year were: President, A. R. Joyce, Joyce-Watkins Company, Chicago; first vice-president, C. M. Taylor, superintendent, Port Reading Creosoting Plant, C. R. R. of N. J. and P. & R., Port Reading, N. J.; second vice-president, E. B. Fulks, consulting engineer, Chicago; secretary-treasurer, F. J. Angier, superintendent timber preservation, B. & O., Baltimore, Md.

The convention was called to order at 10:30 Tuesday morning and was welcomed to San Francisco by the Hon. James Rolfe, mayor of the city, J. H. Waterman (C. B. & Q.) responding for the association. The secretary-treasurer reported that 81 members had been elected during the year and that the membership on December 31, 1920, was 373. Forty railroads were represented in this membership with a total of 97 members.

In his opening address, A. R. Joyce traced briefly the development of the spirit of co-operation which has been shown throughout the industry in recent years, and which has fostered the more general realization of the value of the treatment of timber. He spoke optimistically of the future, predicting that timber preservation is now on the eve of a tremendous expansion.

REPORT ON MARINE BORERS IN SAN FRANCISCO BAY PILING

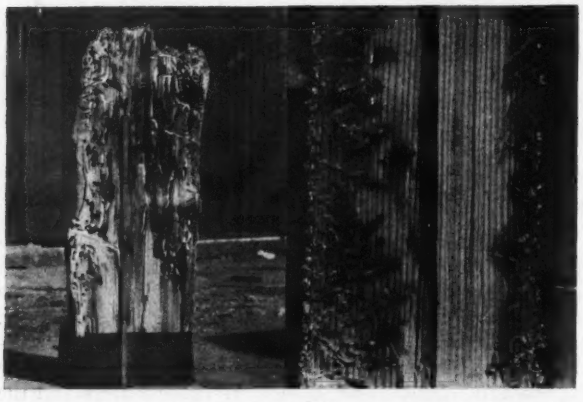
EARLY IN 1914 the activity of marine borers was noticed in the dykes of the Mare Island Navy Yard, at the upper extremity of San Pablo bay, which is the northern arm of San Francisco bay, as well as at two nearby points on the east shore of that bay. One of the latter was a dock between Crockett and Vallejo Junction and the other a dock at Oleum, a mile or so south of Crockett. Sporadic attacks of marine borers are reported to have been observed in that region at isolated times running as far back as 1870, although no certainly authentic records of them could be secured. In any case, however, these attacks were of short duration and did no serious damage. For many years previous to the attack of 1914 the unusual facilities offered around the shores of San Pablo bay and the water front above that bay, including Carquinez straits, Suisun bay, and the lower course of the Sacramento river, had attracted many large industries. The waterfront structures erected by these varied industries were all built on untreated piling, because of the absence of marine borer activity in those waters and the belief that the fresh water discharged into San Pablo bay from the combined flows of the Sacramento and San Joaquin rivers would probably prevent any invasion of San Pablo bay by salt water, which would carry with it the various forms of marine borers.



Section of Pile After 2½ Years' Service, Showing Larger Holes of Xylotrya in Center and Smaller Holes of Teredo Near Edge

The attack of 1914 appeared to be sporadic, like the earlier ones. But at Mare Island in 1917 attacks by the same shipworm, which was identified as a teredo, again appeared, and during the following years spread very rapidly and increased in severity. In the latter part of 1919 the attacks had progressed to such an extent that parts of waterfront structures and in some cases whole docks began to fail. In 1920 these failures assumed such proportions and became of such frequent occurrence that the critical nature of the local situation was brought to the attention of the officials of the American Wood-Preservers' Association on June 16, 1920. As a result, a special committee was appointed on July 22, 1920, to study the marine piling problem in San Francisco bay, with instructions to report at the seventeenth annual meeting of the Association at San Francisco in January, 1921. The committee so appointed was enlarged from time to time as new local interests became enlisted, but began its active work late in July, 1920.

The objects of the survey were to determine the extent of the damage from marine borers in San Francisco bay, especially that of excessive severity which has occurred within the last three years in the northern portion of the bay; to determine the present distribution of the several marine borers and as much of their past history in the bay as it was possible to learn; to increase the pres-



Left—Interior of Untreated Fir Pile After 7 Years' Service. Right—Sections of Pile After Four Months' Service, Showing Four Inch Penetration by Teredo

ent knowledge of the dissemination, growth and habits of the borers; to study the factors influencing the rate of attack and amount of damage from them, including the effect of climate and river discharge upon the salinity conditions in the bay; to throw more light upon the effectiveness, both in physical life and economic advantage, of the various methods of protecting wooden piling, and of the substitutes for it, together with the best methods of construction which have been developed, and to collect data on the relative costs of the different methods of protection and construction.

The borers found in these waters include the xylotrya, teredo, limnoria and the sphaeroma. The report described in detail the characteristics of these organisms and the effects of their attacks. While the report was one of progress only and the work will be continued, the following conclusions were drawn:

(1) Marine borers are very active in San Francisco bay, and in places where their attack is severe will destroy untreated piling in as short a time as six to eight months. In other places the untreated piling may last two to four years.

(2) The information secured indicates that it is reasonable to expect a life of five to eight years from paint and batten protections if the work is well done. If it is not well done or if the covering is damaged by careless handling this range of life cannot be expected.

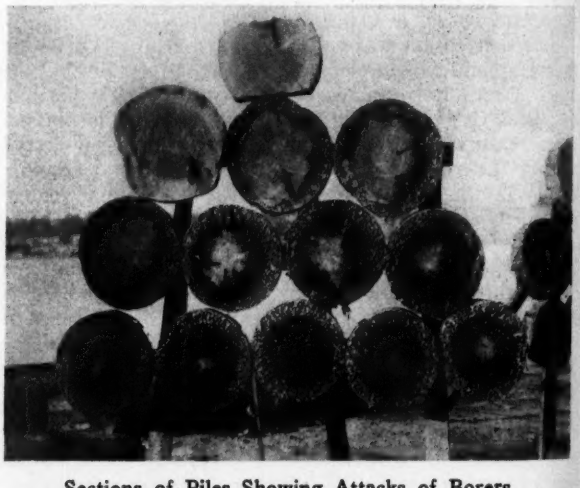
(3) When carefully handled so that there is no injury extending through the shell of treated wood within the water section, it appears possible for properly creosoted Douglas fir bearing piling to give a life of 25 to 30 years in San Francisco bay. Poorly treated piling or piling damaged by careless handling cannot be expected to last nearly as long. Under existing conditions, with the necessity of using piling shipped in from distant points, and on account of the damage liable to occur during repeated handling, storage and rafting, the average length of life secured has been considerably less.

(4) Most of the attack on creosoted piling by marine borers, which the committee has observed throughout this survey, appears to have begun in spots where untreated wood has been exposed by damage in handling the piles or placing the superstructure. It is urgently recommended that improvements be made in the methods of handling creosoted piles and building structures upon them, so that damage to the surface of the piles may be reduced to a minimum.

(5) Precast reinforced concrete piles and pile casings have not been in use in San Francisco bay a sufficient length of time to determine their ultimate life. A detailed examination of those structures which have been in service for ten years shows no evidence of deterioration and they seem capable of a long further life. The length of life to be expected from this type of construction is largely dependent upon the quality of materials and workmanship and the skill and care with which they are employed; and any laxity in these particulars will materially shorten the length of service which may be secured.

(6) Cast in place concrete pile jackets and cylinders may be expected to give satisfactory results if properly constructed of suitable materials. The difficulties of this type of construction, however, are of such a nature that the probability of securing a maximum length of life is less than in the case of precast concrete piles or pile coverings.

(7) The selection of a type of piling or pile protection for a given structure must be made upon the basis of cost and permanence of the materials under consideration, the character of the structure and the probable need for future alterations to meet the changing requirements of commerce. When a comparatively short increase over the life of green wooden piling is sufficient, the surface protections will often be found economical in waters not exposed to severe storm action; if a moderately long physical life approximating the average economic life of marine structures in this harbor is desired, a good creosote treatment will provide it at the lowest annual cost so far as present knowledge goes; if conditions warrant building for the greatest permanence, with less regard for first cost, concrete construction may be useful. For the protection from further damage of wooden piles already in



Sections of Piles Showing Attacks of Borers

place and showing attack by borers, not yet severe enough to require condemnation, the concrete casing, precast or poured in place, is the only means of salvage so far found by the committee.

REPORT ON PRESERVATIVES

THE COMMITTEE on Preservatives presented an extended report on zinc chloride, its handling at the plant, methods of analysis, physical and chemical properties, etc. The report contained a great deal of valuable information concerning this preservative for the use of the plant operator.

VERTICAL-RETORT TAR

Because of the increasing importance of "vertical-retort tar," the committee also presented a report on this product. At the present time the total daily capacity of vertical installations of all kinds is slightly over 19,000,000 cu. ft. per day. This is equivalent to a production of between 9,000,000 gal. and 10,000,000 gal. of vertical-retort tar per year. With the existing high cost of gas oil, and the probability that it will continue high for a number of years, a very considerable number of plants are considering the installation of more coal gas capacity, and plans are drawn for the installation of 85,000,000 cu. ft. of vertical retorts. This will bring up the production to between 40,000,000 gal. and 50,000,000 gal. of tar per year.

Coke-oven tar in its general characteristics resembles on one hand coke-oven tar and on the other, blast-furnace tar. Vertical-retort tar is more fluid that coke-oven tar, and is comparatively low in free carbon. Naphthalene is practically absent. Its tar acid content and sulphonation residue are high. Creosote oil made from vertical-retort tar on fractionation yields fractions which fall below the specific gravity requirements of the A. W. P. A. specifications, but in general are well above the specific gravity range of oil derived from water-gas tar. Certain vertical-retort tars yield oils having gravities of fractions as low as water-gas oil. The latter tars are unusual, however, and are produced in limited quantities.

WATER-GAS TAR

The following paper by W. H. Fulweiler was submitted as a part of the report of the Committee on Preservatives. Out of 917 plants engaged in the manufacture of illuminating gas about 596 manufacture carburetted water gas, which makes up about 70 per cent of the volume of illuminating gas produced. While about 51 per cent of the plants are located along the eastern coast, and about 35 per cent in the Mississippi Valley, somewhat over 67 per cent of the gas is manufactured by the plants along the Atlantic coast.

Figures for water-gas tar produced indicate that at least during the last 2 or 3 years between 70 per cent and 80 per cent of the tar produced is utilized so that for 1918, 1919 and 1920, the utilized or available production was approximately 70,000,000 gal. in 1918, 75,000,000 gal. in 1919, and 80,000,000 gal. for 1920. The increase in tar marketed is probably due to the fact that the fuel value of the material has become more widely recognized, as it has been found that water-gas tar can be burned with the same installation as fuel oil and with slightly higher efficiency. This has resulted in a very great increase in the value of the material, so that today its market value appears to be from 15 per cent to 20 per cent higher than coal tar. While there is a tendency to reduce the consumption of gas oil, due to its present scarcity and high price, owing to the many advantages that the manufacture of carburetted water gas possesses the production of water-gas tar will continue at about its present rate for a number of years.

Water-gas tar products have been used commercially in the full-cell, Rueping and Card processes with entirely satisfactory operating results. For railroad ties the best results with both the full-cell and Rueping processes have been obtained with a mixture of about equal parts of refined tar and distillate, so that the gravity of the mixture was from 1.04 to 1.07 at 38 deg. C. In this manner, any advantage that may accrue with a higher toxicity of the lighter oils is secured together with the very high penetration, and at the same time the very complete waterproofing effect of the refined tar is secured. In the Card process, where the wood is treated with a mixture of the oil and a zinc chloride solution, some unsatisfactory results have been obtained where crude water-gas tar was used. This resulted in the deposition of a heavy black sediment that collected on the surface of the treated material, making it very disagreeable to handle, and also collected in the bottom of the retorts and working tank. Such precipitation, however, is not noticed in properly prepared and refined water-gas-tar products. It is advantageous to hold the percentage of heavy hydrocarbons, that is, those boiling above 355 deg. C., to less than 40 per cent, and in order to obtain this figure a mixture of distillate oil and refined tar is usually required.

The water-gas tar derivatives have been used in practically every branch of the wood-preserving industry. Its authenticated commercial use in treatment of railroad ties began in 1910, when the Public Service Railway of New Jersey began to use it in a regular 10-lb. treatment on its ties. They probably have in track 500,000 ties treated with water-gas tar. Its use by steam roads began in 1914, when one of the larger railroads began to use it. Since then water-gas tar has been used by the Baltimore & Ohio, the Chicago, Burlington & Quincy, the Pennsylvania and the Philadelphia & Reading. The Baltimore & Ohio and the Chicago, Burlington & Quincy have used water-gas tar in the Card process, the Philadelphia & Reading and the Pennsylvania have used it in the full-cell and Rueping processes.

The Baltimore & Ohio has treated approximately 5,000,000 cross-ties with the Card process, using ½ lb. zinc chloride with 3 lb. water-gas tar. The Chicago, Burlington & Quincy has treated about 171,000 ties with water-gas tar and zinc chloride solution. The Philadelphia & Reading and the Pennsylvania have used water-gas tar in admixtures with coal-tar products in varying percentages from 10 per cent up to straight water-gas tar.

EFFECT OF ZINC CHLORIDE TREATMENT ON STRENGTH OF TIMBER

The committee also presented as information three papers bearing on the effect of zinc chloride treatment on the strength of wood by (1) W. K. Hatt, (2) H. B. Luther and (3) T. R. C. Wilson and Ernest Bateman, respectively. The latter two papers are abstracted below. Based on the information contained in these three papers, the Preservatives committee drew the conclusion that they seem to indicate that:

(1) The treatment of wood with the usual strength of zinc chloride solutions seems to have but little permanent effect upon the strength of wood in bending even five years after treatment, provided the temperature of the wood during that time is not excessively high.

(2) There seems to be a slight permanent decrease in the resistance of zinc treated wood to shock even at the normal temperatures. This decrease seems to be greater with greater absorptions of zinc chloride.

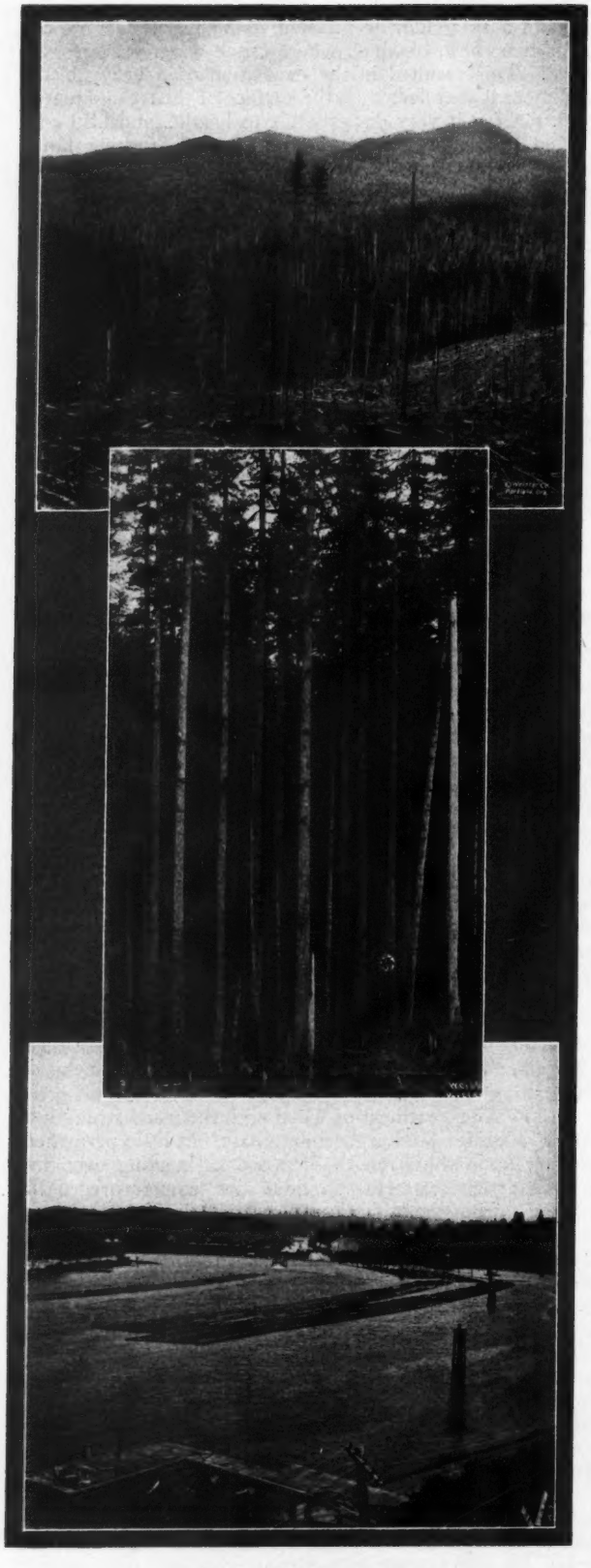
(3) At temperatures somewhat higher than the normal there may be a considerable reduction in all strength values.

EFFECT OF ZINC CHLORIDE TREATMENT ON STRENGTH OF TIMBER

By H. B. LUTHER

Assistant Professor of Civil Engineering, Massachusetts Institute of Technology

IT IS well known that various chemical preservatives with which timber is treated to prevent rot have an effect on some of the physical properties of the timber. As the need of a preservative is in large part due to the high cost of replacing timbers after they have deteriorat-



In the Fir Country

Dense Growth of Young Trees
Large Trees
Towing Logs to the Mills

ed, the prevention of rot at the cost of a certain amount of strength is of undoubted value, but it is important to know under what conditions the reduction of strength due to a given preservative may be too rapid or too marked to make its use feasible. The study of this problem of the proper limiting conditions for the use of the Burnett, or zinc chloride process, has been the object of the investigations reported herein. The work was undertaken in the Department of Civil Engineering at the Massachusetts Institute of Technology.

These tests were confined to specimens of loblolly sapwood of 2 in. by 2 in. by 30 in. size and the treatment, while in commercial quantity, was made by immersion in a cold solution and in no case by the pressure process, so that some further studies may well be deemed feasible.

The results of these tests are summarized thus:

(1) For the specimens stored at 75 deg. F., there was no appreciable difference in strength between the treated and untreated timbers.

(2) For those stored at 100 deg. F., in compression parallel to the grain, there was a decrease of 3.5 per cent in the treated specimens; in cross-bending, a decrease of 17.6 per cent.

(3) For those stored at 150 deg. F., in compression parallel to the grain, there was a decrease of 20.6 per cent in the treated specimens; in cross-bending, a decrease of 49 per cent.

These results lead to the following conclusions:

(1) Zinc chloride, when used as a preservative, decreases the strength of timbers subjected to relatively high temperatures. The deteriorating effect is likely to be very marked when extreme conditions of heat are encountered. Furthermore, the deterioration is continuous, for several years, at least.

(2) There is a safe temperature below which the effect of the zinc chloride is negligible. This limiting temperature cannot be definitely fixed from the information now at hand, but is somewhat higher than 75 deg. F., although the deteriorating effect is marked when the temperature is 100 deg. F.

TESTS OF THE EFFECT OF ZINC CHLORIDE ON THE STRENGTH OF WOOD

By T. R. C. Wilson and Ernest Bateman

ABOUT SIX years ago a small series of tests were undertaken at the Forest Products Laboratory as a study of the effect of zinc chloride on the strength of timber. The tests were planned to include Douglas fir and longleaf pine. Because of some difficulties in securing material, shortleaf pine was to a large extent substituted for longleaf. A small amount of spruce pine was used to fill out the series.

Material for treatment and test was prepared in the form of air-dried sticks 2 in. by 2 in. by 8 ft. Each of these sticks was cut into a pair of pieces 4 ft. long, one of which was treated as described later, the other was left in an untreated condition and tested at the same time as the treated stick to which it was paired. Previous to treatment the sticks were divided into groups according to species and according to whether they were heartwood or sapwood. Each of these groups was then divided into four sub-groups, into one of which it was planned to inject 0.25 lb. dry zinc chloride per cubic foot, another sub-group 0.50 lb., another 0.75 lb., and another 1 lb. In order to accomplish this the strength of the solution was varied for the different sub-groups. This variation in strength of the solution was from 0.6 per cent to 3.6 per cent. The moisture content of the sticks previous to treatment averaged from 11 per cent to 18 per cent in the various sub-groups. Actual average absorptions from

0.22 lb. to 1.11 lb. of dry salt were obtained. One-third of the sticks of each sub-group, together with the untreated sticks to which they were paired, were subjected to mechanical tests four months after treatment, one-third one year after treatment, and the remaining one-third five years subsequent to treatment. During the time between treatment and test the treated sticks with their corresponding untreated mates were stored in open sheds.

CONCLUSIONS

The data shown are somewhat erratic and lacking in consistency. It is believed, however, that taken in conjunction with the other data which are discussed and referred to by the Committee on Preservatives, they justify the statement of the following tentative conclusions:

That for a short time subsequent to treatment there is a relation between concentration of preservative (in the wood) and strength properties, but that later changes take place which modify this relation.

With some properties, such as modulus of elasticity and maximum crushing strength, the effect of the preservative very largely disappears. In other cases, such as those test values which are indicative of resistance to shock (work to maximum load in static bending and height of drop in impact bending) the effect of the lighter concentrations increases and there is a fairly definite indication of permanent and possibly increasing deteriorating effect.

The data are insufficient to yield information as to whether treatment with zinc chloride differently affects different species.

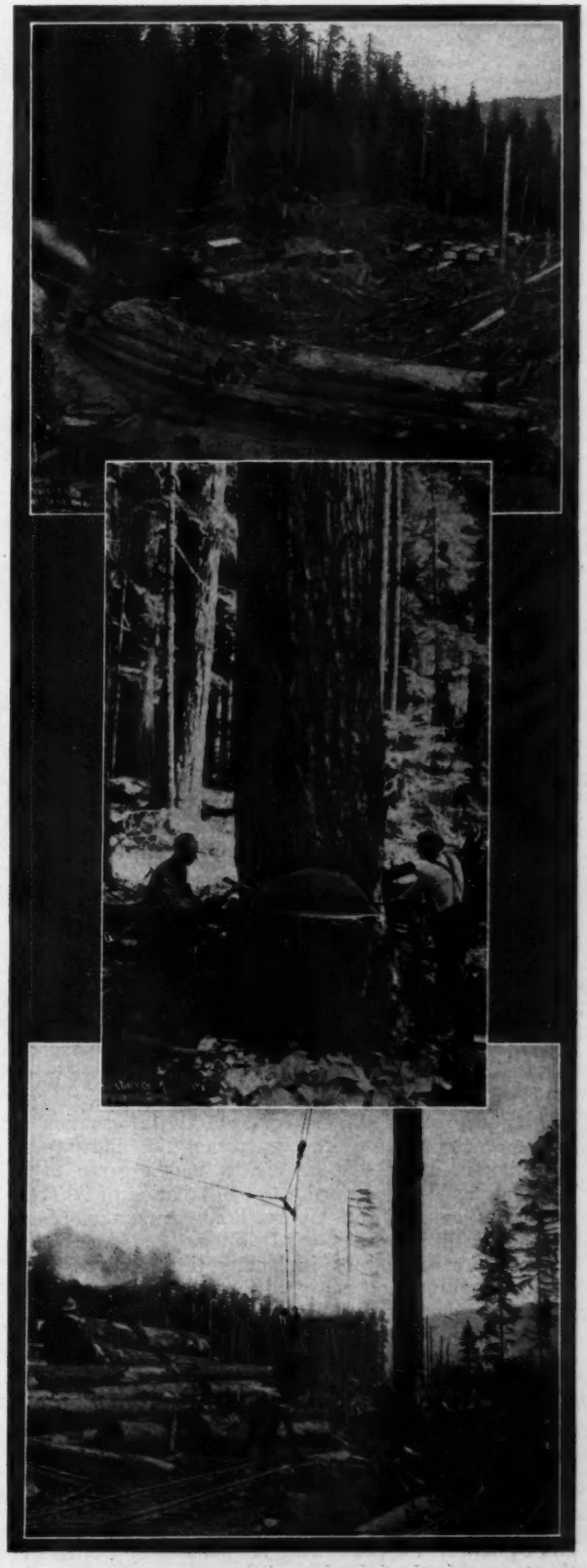
Attention is called to the fact that the sticks used in these tests were small, and quite thorough penetration of the solution was secured, so that the salt was quite uniformly distributed through the stick. If in the commercial treatment of ties or larger timbers an average absorption of a certain amount of dry salt, say ½ lb. per cubic foot, is obtained, this absorption will be much greater than the average in some timbers and much less in others. Particularly is it to be expected that the outer parts of large timbers will receive much more than the average amount of salt, while the central portions may get little, if any. Consequently, while commercial treatments are supposed to inject an average of ½ lb. of dry salt per cubic foot it is probable that the outer portions will receive a much greater concentration.

REPORT ON NON-PRESSURE TREATMENT

THERE ARE innumerable cases where pressure treatment is either impossible or inadvisable and the wood must be either treated by a non-pressure process, used without treatment of any kind, or replaced by some other structural material. There are three principal methods by which wood can be treated without the use of artificial pressure, namely: (1) Surface treatments, (a) spraying, (b) brushing, (c) dipping; (2) hot and cold bath treatment, (3) steeping treatment. With methods (1) and (2) coal-tar oil and similar oil should be used. With method (3) water-soluble preservatives, such as zinc chloride, sodium fluoride and mercuric chloride should be used. In the case of mercuric chloride this is called Kyanizing.

The value of these treatments is likely to be greatly impaired, if not entirely lost, unless thoroughly seasoned timber is used. Specific cases in which non-pressure treatments are likely to be advisable are as follows:

(1) For treating timbers and lumber used in building and car construction and repair work which must be framed at the building site, or which are used in such small quantities that it is impracticable to send them



In the Fir Country

On the Way to the Mill
Making the Undercut
Loading Logs on Trains

away for pressure treatment. Of the various non-pressure treatments possible, hot and cold bath treatments with creosote will generally be most effective.

(2) For timbers used in interior construction where the ends are placed on concrete, brick, or stone foundations, and only the ends are subject to decay, and for any other timbers where only points of contact with wood or other material are likely to decay prematurely.

(3) For fence posts under conditions which make pressure treatment out of the question, hot and cold bath creosote treatment of the butts is recommended, together with a hot or cold bath treatment of the tops.

(4) For telegraph and telephone poles of durable species, from which experience has demonstrated good service may be expected when butt treated, the hot and cold bath treatment is recommended. Surface treating the butts of poles of durable species with creosote is usually also sufficiently effective to more than pay for the cost of treatment and may be used to good advantage where conditions prevent more thorough treatment.

(5) In general, the hot and cold bath treatment is the nearest substitute for pressure treatment, and is to be recommended in preference to the more superficial treatments. Dipping, spraying, and brush treatments are more superficial than the hot and cold bath process and generally result in only a slight penetration of oil.

DISCUSSION

In the discussion of this paper, R. F. Hosford (A. T. & T. Co.) stated that the examination of poles treated, seasoned and unseasoned showed little difference after 10 years service. W. Buehler (Barrett Co.) emphasized the importance of the committee's recommendation for seasoning, particularly in the treatment of poles by inexperienced persons.

THE TREATMENT OF TIES

THE committee on Service Tests of Ties presented detailed information in tabular form on the service secured from treated ties in tracks of the A. T. & S. F., the B. & O., the C. I. & L., the C. R. I. & P. and the St. L.-S. F. Owing to the fact that a comprehensive report of the records on these and other roads was published by the association a year ago, it was not considered advisable to reprint this record after so short an interval and the report this year was therefore brief.

In the discussion of this report, W. H. Kirkbride (S. P.) deprecated the lack of accurate information of this character and, while recognizing the difficulty of collecting it, urged that more attention be given to its compilation. He described a test installation of 90 creosoted ties installed on his road 20 years ago, 65 of which are still in service. S. D. Cooper (A. T. & S. F.) outlined the method of inspecting ties removed from track, inaugurated on that road three years ago, whereby no ties are destroyed until they have been examined by an inspector from the timber-treating department. This plan has greatly reduced the number of ties removed prematurely. O. C. Steinmayer (St. L.-S. F.), C. F. Ford (C. R. I. & P.) and others described the impracticability of attempting to secure a record of the life of all ties removed from tracks and the necessity of confining observation to certain selected sections.

Closely related to this report was one on fir ties which described briefly the recent developments in the methods and equipment for puncturing the surface of Douglas fir ties to permit the injection of the preservative into the timber. A series of experiments has been undertaken at the plant of the St. Helens Creosoting Company, St. Helens, Ore., to ascertain the effect of this puncturing on the seasoning of the timber, the penetration of the preservative and the physical properties of the timber, but these tests have not yet progressed sufficiently far to permit any conclusions to be drawn.

OTHER REPORTS AND PAPERS

BECAUSE of the widely varying local conditions, the committee on Switch-Tie Yards confined its report to general considerations. It urged that in laying out a switch-tie yard, all details be arranged to the end that as much of the handling as possible be done mechanically. Many plants are using locomotive cranes to handle their switch-ties, others use the rubble car to aid in distributing the different length ties to the proper pile, and possibly there are plants using some type of power conveyor to move the switch-ties to and from the piles. It is assumed that the switch-ties are of 6-in. variation in length, and range from 8 ft. to 16 ft. 6 in. in length. In its conclusion the committee emphasized the fact that switch-ties ought to be piled in separate lengths, for the following reasons:

(1) Any length of switch-tie can be gotten at quickly without extra handling.

(2) If switch-ties are loaded on trams in random lengths as many cubic feet cannot be loaded into a charge as can be done if each tram is loaded with only one length.

(3) Where it is required to ship switch-ties in sets they can be loaded more conveniently on the trams and handled at less cost. While it costs more to separate them when they are first unloaded on the yard, this is more than offset by saving the cost of separating them from a pile of mixed lengths when ready for treatment.

The committee on Pressure Treatments presented a report on the service rendered by four groups of treated poles carrying important lines of the American Telephone and Telegraph Company built in 1897 and 1899.

A paper on the Use of Creosoted Wood Conduit on the Pacific Coast was presented by C. H. Judson and E. Wismer; one on the History of Wood Pipe and Some Data on its Use by E. J. Bartels; one on Creosote Treatment for Douglas Fir Pipe Staves by H. E. Horrocks and one on The Isolation of Barren Oil from Coal-Tar Creosote by Ernest Bateman, chemist in forest products, U. S. Forest Products Laboratory, Madison, Wis.

The committee on Non-Pressure Treatments described the perforating process which has been developed during the past year by the Western Cedar Pole Preservers at Sand Point, Idaho, to puncture poles for a distance of 1½ ft. above and below the ground line to permit the creosote to enter the timber, these holes being spaced 2½ in. vertically and not over $\frac{1}{16}$ in. circumferentially. It is stated that this machine permits of practically complete penetration of oil to the depth of the perforations.

The committee on Inspection presented a detailed outline of the duties of an inspector of treated timber and a statement of his qualifications.

CLOSING BUSINESS

AT THE closing session on Thursday morning the following officers were elected for the ensuing year: President, C. M. Taylor, superintendent Port Reading Treating Plant (C. R. R. of N. J.-P. & R.), Port Reading, N. J.; first vice president, F. J. Angier, superintendent timber preservation, B. & O., Baltimore, Md.; second vice president, H. S. Valentine, superintendent, Eppinger & Russel Co., New York City; secretary-treasurer, George M. Hunt, chemist, Forest Products Laboratory, Madison, Wis.; directors, R. J. Calder, secretary-treasurer, International Creosoting and Construction Co., Galveston, Tex., and H. S. Sackett, assistant purchasing agent, C. M. & St. P., Chicago. It was voted to hold the next annual convention in Chicago in January, 1922.

Group of Tie Producers at San Francisco

TIE MEN ADOPT STANDARD SPECIFICATIONS

Proposed Requirements of A. R. E. A. Accepted at Annual Convention at San Francisco on January 27-28

THE National Association of Railroad Tie Producers' third annual convention, which was held at San Francisco, Cal., on January 27-28, was marked principally by the adoption of standard specifications for cross ties which differ only in a few particulars from those which the Tie committee of the American Railway Engineering Association will recommend to that organization for adoption at its annual convention at Chicago in March.

Owing to the conditions now prevailing in the railway industry and the remoteness of the convention from the tie-producing areas of the Central States, the attendance was limited to about 50 members and guests. The meeting was further affected adversely by the sudden death of E. M. Blake (Charles R. McCormick & Co., San Francisco, Cal.), president of the association, on January 12. However, owing largely to the constructive work of Mr. Blake during the year, the association recorded marked progress during the year, now enrolling 61 individuals and firms who produce approximately 50,000,000 ties annually. The sessions of the convention were presided over by John H. Johnson (B. Johnson & Son, Richmond, Ind.), treasurer of the Association.

THE STANDARD SPECIFICATION

THE standard specification was presented by W. Nixon (Western Tie & Timber Co., St. Louis), chairman of the committee, who urged its adoption. The specification is as follows:

Specifications for Cross Ties

Material

Kinds of wood: Before manufacturing ties, producers shall ascertain which of the following kinds of wood suitable for cross ties will be accepted: Ash, beech, birch, catalpa, cedar, cherry, chestnut, cypress, elm, fir, gum, hackberry, hickory, larch, locust, maple, mulberry, oak, pine, poplar, redwood, sassafras, spruce, sycamore, and walnut. Others will not be accepted unless specially ordered.

Physical Requirements

General quality: All ties shall be free from any defects that may impair their strength or durability as cross ties, such as decay, large splits, large shakes, large or numerous holes or knots, or grain with slant greater than one in fifteen.

Resistance to wear: Ties from needle-leaved woods shall be of compact wood throughout the top fourth of the tie, where any inch of radius from the pith shall have not less than one-third summerwood in six or more rings of annual growth, or not less than one-half summerwood in fewer rings. Ties of coarse wood having fewer rings or less summerwood will be accepted if specially ordered.

Resistance to decay: Ties for use without preservative treatment shall not have sapwood wider than one-fourth the width of the top of the tie between 20 in. and 40 in. from the middle, and will be designated as "heart" ties. Those with more sapwood will be designated as "sap" ties.

Design

Dimensions: Before manufacturing ties, producers shall ascertain which of the following lengths, shapes, or sizes will be accepted, and whether ties are to be hewed or sawed and in either case whether on the sides as well as on the top and the bottom.

All ties shall be 8 ft., 8 ft. 6 in., or 9 ft. long.

All ties shall measure as follows throughout both sections between 20 in. and 40 in. from the middle of the tie:

Grade	*Sawed or hewed top, bottom, and sides*	*Sawed or hewed top and bottom*
1	None accepted	6 in. thick by 6 in. wide*
2	6 in. thick by 7 in. wide*	6 in. thick by 7 in. wide
3	6 in. thick by 8 in. wide	6 in. thick by 8 in. wide 7 in. thick by 7 in. wide
4	7 in. thick by 8 in. wide	7 in. thick by 8 in. wide
5	7 in. thick by 9 in. wide	7 in. thick by 9 in. wide
6	7 in. thick by 10 in. wide	7 in. thick by 10 in. wide

Northern white cedar or tamarack (larch) pole ties manufactured from timber, measuring 8 in. in diameter under the bark at the small end, shall be classed as grade No. 1. All other usable ties shall be classed as grade 0 ties.

Manufacture

All ties shall be straight, well hewed or sawed, cut square at the ends, have bottom and top parallel, and have bark entirely removed.

Inspection

Ties will be inspected after delivery at suitable and convenient places satisfactory to the railroad, which reserves the right to inspect ties at points of shipment or at destination. Ties will be inspected at points other than the railroad's property whenever in the judgment of the railroad there is sufficient number to warrant it; but the shipper shall provide accommodations for the inspector while away from rail or steamer lines and transport him from or to a railroad station or steamer landing.

Inspectors will make a reasonably close examination of the top, bottom, sides and ends of each tie. Each tie will be graded independently without regard for the grading of others in the same lot. Rafted or boomed ties too muddied for ready examination will be rejected. Ties handled over hoists will be turned over as inspected.

Ties will be rejected when decayed in a degree sufficient to materially impair the strength or serviceability, except that the following will be allowed: in cedar, "pipe or stump rot" up to 1½ in. in diameter and 15 in. deep; in cypress, "peck" up to the limitations as to holes; and, in pine, "blue sap stain."

A large hole in woods other than cedar is one more than ½ in. in diameter and 3 in. deep within, or more than 1 in. in diameter and 3 in. deep outside the sections of the tie between 20 in. and 40 in. from its middle. Numerous holes are any number equaling a large hole in damaging effect. Such holes may be caused in manufacture or otherwise.

A large knot is one exceeding in width more than ¼ of the width of the surface on which it appears; but such a knot may be allowed if it occurs outside the sections of the tie between 20 in. and 40 in. from its middle. Numerous knots are any number equaling a large knot in damaging effect.

*Width of tie in all cases refers to the *top* width.

A shake is a separation of one ring of annual growth from another. One which is not over 4 in. long or ¼ in. wide will be allowed.

A split is a break across annual rings. One which is not over 10 in. long will be allowed provided a satisfactory anti-splitting device has been properly applied.

A tie will be considered straight: (1) When a straight line along the top from the middle of one end to the middle of the other end is entirely within the tie; (2) when a straight line along a side from the middle of one end to the middle of the other is everywhere more than 2 in. from the top and the bottom of the tie.

A tie is not well hewed or sawed when its surfaces are cut into with score-marks more than ½ in. deep or when its surfaces are not even.

The lengths, thicknesses and widths specified are minimum dimensions. Ties over 1 in. more in thickness, over 3 in. more in width, or over 2 in. more in length, will be degraded or rejected.

The top and bottom of a tie will be considered parallel if the difference in the thicknesses at the two sides or ends does not exceed ½ in., that is, one side may be 7¼ in. while the other is 6¾ in. wide; or one end may be 6¾ in. while the other is 7¼ in. thick.

All thicknesses and widths apply to the sections of the tie between 20 in. and 40 in. from the middle of the tie. All determinations of widths will be made on the top of the tie, which is the narrower of the horizontal surfaces.

Ties which are oversize will be accepted as follows: 8 in. to 9 in. by 9 in. to 12 in. as Grade 4; 9 in. to 10 in. by 9 in. to 12 in. as Grade 3. Ties over 10 in. thick or over 12 in. wide on top will be rejected. Ties will be graded up by their smaller ends and graded down by their larger ends. The dimensions of the tie will not be averaged.

Split redwood ties are permitted a slight variation in size but such variation must not be more than ½ in. one way or ¼ in. two ways.

DELIVERY

Ties delivered on the premises of the railroad for inspection shall be stacked not less than 10 ft. from the nearest rail of any track at suitable and convenient places; but not at public crossings, nor where they will interfere with the view of trainmen or of people approaching the railroad. Ties shall be stacked in alternate layers of 2 and 7, the bottom layer to consist of 2 ties kept at least 6 in. above the ground. The second layer shall consist of 7 ties laid crosswise of the first layer. When the ties are rectangular, the two outside ties of the layers of 7 and the layers of 2 shall be laid on their sides. The ties in layers of two shall be laid at the extreme ends of the ties in the layers of 7. No stack may be more than 12 layers high, and there shall be 5 ft. between stacks to facilitate inspection. Ties which have stood on their ends on the ground will be rejected.

Each stack shall have fastened to it a tag on which is written the owner's name and address, the date when stacked, and the number of ties of each kind of wood in the stack.

All ties are at the owner's risk until accepted. All rejected ties shall be removed within one month after inspection.

Ties shall be stacked as grouped below. Only the kinds of wood named in a group may be stacked together.

CLASS U—TIES WHICH MAY BE USED UNTREATED

Group Ua	*Group Ub*	*Group Uc*	*Group Ud*
Black Locust	"Heart"	"Heart" Cedars	"Heart" Catalpa
White Oak	Douglas Fir	"Heart" Cypress	"Heart" Chestnut
Black Walnut	"Heart" Pines	"Heart" Redwood	"Heart" Red Mulberry
			"Heart" Sassafras

CLASS T—TIES WHICH SHOULD BE TREATED

Group Ta	*Group Tb*	*Group Tc*	*Group Td*
Ashes	"Sap" Cedars	Beech	"Sap" Catalpa
Hickories	"Sap" Cypress	Birches	"Sap" Chestnut
"Sap" Black Locust	"Sap" Douglas Fir	Cherries	Elms
Red Oaks	Hemlocks	Gums	Hackberry
"Sap" Black Walnut	Larches	Hart Maples	Soft Maples
Honey Locust	"Sap" Pines		"Sap" Mulberries
	"Sap" Redwood		Poplars
			"Sap" Sassafras
			Spruces
			Sycamore
			White Walnut

SHIPMENT

Ties forwarded in cars or vessels shall be separated therein according to the above groups, and also according to the above sizes if inspected before loading.

DISCUSSION

The attitude of producers towards this specification was presented by representatives of the various producing areas, who in general urged its adoption. It was pointed out that nothing in the specification prevented a road from waiving certain provisions if local conditions should make this desirable. It was further emphasized that a standard specification, enforced by uniform inspection, created confidence in a product, particularly on the part of purchasers removed from the point of production. R. L. Wyman (S. P. & S.) stated that 37 full cargoes of ties were shipped to Eastern roads by water in 1919 in addition to several thousand carloads by rail, while, since the termination of federal control, Eastern roads have continued to come west for their ties and over 20 cargoes have been shipped by water in addition to over 1,000,000 ties by rail. The standard specifications enabled the Western mills to take this business safely.

After considerable discussion and difference of opinion, the specifications were adopted.

STATISTICS AND OTHER MATTERS

REPORTS of production during the year and forecasts for the 1921 output were presented by regional vice-presidents. In the Tennessee area the production was low in the spring but increased to the highest ever known in August and September, although it has again declined until it is now only 25 per cent of normal. However, the roads in this territory are now better supplied than for years. The conditions in the Southwest were reported to be similar, the principal retarding effect being the inability of many of the roads to pay their bills promptly, this in turn requiring the producers to curtail their activities. In the Central Western States, the production of ties has increased greatly, 2,500,000 ties being cut in Illinois in 1920 as compared with 1,000,000 in the preceding year. In the far West, the 1920 production was about normal, aggregating between 14,000,000 and 15,000,000 ties. The outlook for a large production in this area is less favorable, for the logging for the season is done before March 1 and the present depression in the lumber industry is causing a curtailment of logging operations.

THE EXPORTATION OF TIES

In a paper entitled The Production of Douglas Fir Cross Ties for Export, A. A. Baxter, general manager of the Douglas Fir Exploitation and Export Company, presented data regarding the number of these ties shipped for export from the West coast during 1920. These include not only cross ties, but also switch ties, both treated and untreated, as follows:

UNTREATED

United Kingdom	103,100,000 ft. b. m.
China (sold and shipped in 1920)	1,100,000 ft. b. m.
China (sold in 1920, to be shipped during the first half of 1921)	7,200,000 ft. b. m.
West Coast of South America	990,000 ft. b. m.

TREATED

China—Taku Bar	415,000 ft. b. m.
India	7,411,000 ft. b. m.
San Domingo	1,473,000 ft. b. m.
Total untreated	112,390,000 ft. b. m.
Total treated	9,299,000 ft. b. m.
Grand total	121,689,000 ft. b. m.

OTHER PAPERS

Other papers presented at this meeting included the following:

The Relation Between Tie Producers, Treating Plants

and the Railroads, by R. A. Calvin, The Kettle River Company.

The Various Factors Entering Into the Cost of Delivered Cross Ties to Producing and Non-Producing Roads, by Howard Andrews, The Nashville Tie Company.

The Function of the Small Mill in Tie Production, by J. S. Magladry, The Bohemia Lumber Company.

A Synopsis of the Administration of Section 10 of the Clayton Anti-Trust Act, by Clarence Oddie, Western Representative, American Short Line Railroad Association.

The Use of Mechanical Power in the Production of Cross Ties, by R. J. Witherell, L. D. Leach & Co.

The Timber Resources of the United States with Especial Reference to the Pacific Coast, by C. L. Hill, in charge Office Forest Products, U. S. Forest Service.

The Tie Supply of the Future, by John Foley, Pennsylvania System.

CLOSING BUSINESS

At the concluding session of the convention on Friday afternoon the following officers were elected:

President, Charles R. McCormick, Charles R. McCormick & Co., San Francisco, Cal.; first vice-president, J. H. Johnson, B. Johnson & Son, Richmond, Ind.; second vice-president, R. J. Witherell, L. D. Leach & Co., Chicago; secretary, Warren Nixon, Western Tie and Timber Company, St. Louis, Mo.; treasurer, J. J. Schlafly, the Potosi Tie and Lumber Company, St. Louis, Mo.

Chicago was selected as the place of next meeting.

Heating Railway Buildings Economically*

BY R. H. BLACK,
Engineer of Power Plant Construction, Grand Trunk, Montreal, Que.

HEATING systems in railway buildings often compare unfavorably with those used in buildings owned by private industrial concerns, the reason being that railways usually make their own installations, and the men employed are not always heating tradesmen, but are picked up from other departments and are not primarily interested in heating work. What they know has been learned from actual contact with other railway heating plants so that obsolete practice has a strong tendency to be perpetuated.

What is mostly needed is a campaign of education, and any railway contemplating extensive improvement in its heating systems would be well advised to study this problem from the start.

It is the purpose of this paper to recommend a standard practice in designing new heating plants, and in remodeling those that are inefficient or out of date. In so doing it is not sufficient to decide on a system that will be efficient if correctly operated, but to consider what chance it has of being correctly operated, or if it would not be better to make some sacrifices in certain directions rather than take a chance on personal equations that are beyond control.

For instance, it is needless to state that it is quite impossible to depend on anyone turning radiators on or off, with a view to economy *unless he is paying for the coal.* It simply is not done, and no number of circular letters or printed instructions will ever make any difference. It therefore remains to control the heat at its source, to make one man responsible, to make the system as automatic as may be, or to so arrange it that it is to somebody's personal advantage or comfort that economy be observed.

A heating system in its simplest form consists of a series of stoves placed in different rooms, and these are fairly economical, the possibilities of waste lying in the overheating of the premises (usually only occasional) and the throwing out of unburnt fuel with the ashes. This latter may be serious, but can only be due to carelessness on the part of the attendant and the remedy is obvious. Almost as simple is the Baker heater, which is often available when released from old cars, and works very well in a small building, where not more than one heater is required. These two methods of heating are, everything considered, most economical for the smallest of passenger stations and small building, or sheds at a considerable distance from other buildings, and where they can be attended by baggagemen or other employees in the course of their ordinary duties.

For stations of from 1,500 to 7,500 sq. ft. total floor area, which embrace the majority of ordinary stations, a hot water heating system should be used, with cast iron radiators, and sectional cast iron boiler, burning hard coal and placed for preference in a basement. In the smaller sizes a hot water heating system is better than a steam system in many ways, although its first cost is about 35 per cent more. The large volume of water in circulation acts as an ideal heat storage, giving up heat when fire is low and storing heat when the fire is bright, thus preventing to a large extent the losses due to overheating of the rooms, and calling for less attention to the furnace. Any man with a furnace in his home will know how to run such a system economically and will usually do so if for no other reason than to save himself trouble.

When we come to a larger station, such as is found at a division point, which is usually of two stories with offices above and sometimes a number of buildings arranged in a row, the hot water system may offer increased cost and construction difficulties which make it advisable to use a steam heating system. In most respects the one pipe gravity steam system with boiler in basement using hard coal or other suitable fuel is the most economical steam heating system that can be adopted, and it is certainly the simplest.

There is no possibility of waste of either hot water or steam when the proper air valves are used. Not only the radiators, but the boiler and piping themselves supply heat to the building, and need only be covered when they are likely to give out more heat than is required in the immediate vicinity. (Long horizontal mains also need covering to avoid excessive condensation.)

The system has the inherent disadvantage that the radiators must be either full on or off. However, with the boiler on the premises and the attendant firing it to suit fluctuating weather conditions, what actually happens is that the radiators are alternately heating and cooling, as not sufficient steam is made to heat them all the time, and this prevents overheating the rooms.

To take advantage of this feature it is most important to arrange the piping so that the colder rooms and more exposed portions of the building are given the preference by receiving their steam first. Otherwise it will be found

*Abstracted from a paper presented before the Canadian Railway Club, Montreal, Que., on November 9, 1920.

necessary to overheat one portion of the building in order to heat another adequately. With this attended to, it will be found that the system will work well for two or three buildings which are not more than 100 ft. apart and which have good basements, but under certain circumstances where there is a great difference in exposure or in distance from boiler to radiators it will be necessary to use special air valves on each radiator and connect them all to a small air pump or ejector through a system of piping, which, however, need only be very small. This is known as the air line system and has many recommendations, but is usually an unnecessary refinement for railway buildings.

A station, office or small shop has to be heated, and as a supply of high pressure steam is available a short distance away at, say, the roundhouse, it is proposed to use this, but it is usually not economical to do so. To begin with, there is the loss of heat in the underground pipe supplying the building. With the very best construction this will be about 1 per cent per 100 ft., but if the pipe is merely buried in sand or set in a wooden boxing the loss may be 10 per cent or more.

The condensed steam instead of draining back to the boiler direct must be separated by means of a steam trap. Certain of these steam traps will then return the condensation direct to the high pressure boiler with very little loss, but these traps need careful attention, as with a one pipe system should the trap stop working, the system will rapidly fill with water and it will take some time to get it started again.

The greatest loss, however, is due to the imperfections of human nature. With an unlimited supply of steam from a distant point it will always be found that the building is overheated, and doors and windows left open even in very cold weather. In fact, radiators are rarely, and in some cases never, shut off. One has only to imagine what his coal bill would be if he were to keep his furnace at home going full blast, from October to May, to realize what this means.

It may be argued that the agent or officer in charge should not permit this condition, but a second thought will show that this is one of all duties that can and will be neglected. The only practical way to control the heating of buildings is at the source of heat, and if the baggage man or other employee has to attend the furnace in addition to his other duties, *he will bank the fire to make it last.* It is more than likely that the cost of the underground piping and steam traps will equal or exceed the cost of a sectional cast iron boiler, and at even fairly large stations it will often be found possible to have a certain employee attend the furnace; in fact, where there are offices, a janitor is usually employed in any case.

It is advisable to heat a building from an external source of steam when the following conditions obtain:

(1) When the building is very small, requiring only one or two coils or radiators, and is used by a number of men continually coming in and out. A switch shanty is a good example. There is no one to attend to a stove and the steam will not amount to much. In this case pipe coils may be used with a small steam trap on each coil, properly protected from sediment by means of a dirt trap or dirt pocket (a separator off a freight car is a good thing to use, and can often be obtained from stores). The trap should have no by-pass and should be non-adjustable, except by taking it apart. The condensation should be run back to the boiler room if not more than 200 ft. away, otherwise it should be allowed to drip outside where it can be seen. A reducing valve is not necessary, no great care need be taken in grading pipes, and as the steam is at high temperature only a small coil is required.

(2) When it is intended to heat an existing building, and there is no basement or convenient place for a boiler, or when the building is quite large, over 15,000 sq. ft. floor area, and two or more stories, such as large stations or freight sheds, or two or more buildings some distance apart.

In this case the one piping gravity system is no longer the best to employ and the two pipe vacuum system must be considered. Its advantages are many, for besides the positive circulation which overcomes all troubles due to long distance and low pressure, it gives a low temperature radiator (an important point in economy, as it will not readily cause overheating), and also by using special inlet valves with graduated opening the so-called modulating system is obtained, which allows the heat in individual radiators to be controlled.

The vacuum system is not quite perfect, as it cannot be controlled from a central point. It can be made automatic to operate with thermostats, but these are very expensive ($50 per radiator), and need constant attention, so that its greatest claims to economy are its low temperature and absence of leakage.

It is very necessary in designing the building to make provision for easy access to the heating pipes. If a proper basement is not provided there should be at least four feet of open space between the floor joists and the ground, or where mastic or tile flooring is used ample pipe trenches should be provided, which can be reached without destroying the floor.

Roundhouse heating is a problem in itself and a very difficult one. It is well recognized that the hot blast system, in which a fan driven by mechanical power draws air through a nest of steam pipes or cast iron sections and discharges it through ducts to different points, usually the engine pits, is the most satisfactory system that can be used. It is not always recognized, however, what an enormous amount of steam is required to run these plants and they are therefore often made much too large for the boiler capacity provided.

The provision of the correct amount of radiation or heat supply has an important bearing on economy.

In Canada it is necessary to somewhat increase the usual allowance taken as correct for the eastern states, viz., 70 deg. F. room temperature with an outside temperature of zero.

For Eastern Canada 70 deg. F. at 5 deg. below zero is about right. This will give a temperature of about 60 deg. at 20 deg. below zero.

The above is for offices. For stations and shops the following is recommended:

Station waiting rooms.....	65 deg. at zero.
Machine and erecting shops.	60 deg. at zero.
Forge and blacksmith shops.	50 deg. at zero (when not working).
Paint and varnish shops....	65 deg. at zero, with an additional section to maintain this temperature down to 20 deg. below zero.
Roundhouse	60 deg. at zero, based on one air change per hour.

REMODELLING EXISTING SYSTEMS

One often finds a boiler or boilers supplying steam to a system of pipe coils, the coils having valves at each end. The inlet valve is wide open, the discharge valve is supposed to be just cracked, discharging the condensation and also enough steam to make sure of it. The resulting steam and water are discharged into a so-called hot well, a wood or concrete tank placed underground, and the hot water is pumped back into the boilers.

Not so uneconomical on the face of it, but what is really

happening is that some of the coils are discharging steam full bore, for someone feels cold and wants all the heat he can get. Cold water is entering the hot well to make up the waste and as the float valve is out of order (for who can get in and fix it?) it is overflowing to the sewer after being heated to boiling point by the steam from the heating system. The feed water is hot, there is no steam to be seen anywhere and no evidence of waste unless the singing of the steam through the coils means anything. There are a great many such plants still in use.

One remedy is to place a steam trap on the discharge to the hot well which may answer, but usually does not. The pipes do not slope in the direction of flow as they should; they sag and slope the wrong way, and although they worked when there was a current of steam blowing out the water all the time, they will fill with water and stop the circulation if the pressure at the outlet is retained by means of a trap.

Usually such a system can be made to work economically by putting a steam trap on each radiator. These may be thermostatic or float, but, unlike vacuum traps, they will be required to withstand a pressure of as much as 25 lb. and must be chosen accordingly. A reducing valve on the steam line should limit the pressure to this or less if possible, but it may be necessary to put in extra radiators to make up for the reduced temperature due to the lower pressure.

Another type of obsolete system is a two-pipe vacuum system using exhaust steam from engine or pumps, but with no traps on the radiators and none of the refinements necessary to a good job. The back pressure on the engine is 10 or 12 lb., the pipes and coils are partly choked with oil from the exhaust steam and as the steam is short circuiting through the nearer radiators, the more distant ones are difficult to heat.

The installation of radiator traps and some slight alteration to the piping will usually make quite a good vacuum system. The oil troubles can be prevented by means of an oil separator and the surplus steam relieved by a back pressure valve. It is necessary to make special provision when using live steam that it shall not escape through the back pressure valve. A gate valve should be placed in the line to isolate this valve and the feed water heater when live steam is being used, a safety vale protecting the heating main from over pressure. This is a somewhat unusual arrangement, but is considered important. The trouble with badly graded piping that cannot be readily changed may often be overcome by trapping it at the low points.

If it is necessary to install additional radiators and no vacuum traps are on hand, their returns should be kept open until such traps can be obtained.

One-pipe heating systems supplied with steam from a distance and discharging their returns to the sewer through a partly open valve are fairly common and are rather difficult to handle. A continuous discharge trap of the float pattern or, better still, two connected in parallel, well protected by large sediment pockets, are the best that can be used for this service.

The next system is one in which the exhaust steam and perhaps some live steam is discharged to the hot well and steam-driven pumps are used to circulate the hot water through pipe coils or radiators in the various buildings. A splendid system in principle, it has gained a very bad reputation through poor design and inattention to detail. Badly proportioned piping causes short circuiting of the water and consequent unequal heating of the coils. Insufficient surface and low temperature give inadequate heat supply. Oil from the exhaust steam mixed with pipe scale chokes the piping badly and corrosion due to air liberated from a continual change of water eats holes in the pipe in a few months.

Properly proportioned, the heating is perfect. With centrifugal pumps forcing water through closed heaters there is no trouble with oil, scale or corrosion. Piping is much smaller than with steam, the multiplicity of radiator traps is dispensed with and all the advantages of thermal storage and control of heat at its source as claimed for the gravity hot water system are retained. The system is applicable to the most remote buildings; in fact, it shows to greatest advantage thus and is particularly adaptable for exhaust steam.

IMPORTANT LABOR BOARD HEARING AT CHICAGO

THE Railroad Labor Board has been in session daily since January 10 conducting a hearing on the petition of the railway employees that the National agreements effected between the roads and their employees by the United States Railroad Administration be continued in effect. Most of this time has been occupied in hearing the evidence submitted by the railroads in opposition to this purpose, primarily with respect to the shop employees, facts being presented to show the inefficiency resulting from the abolition of the piecework system and the large sums that are being paid for work that is not done as a consequence of the application of various clauses in the agreement under the widely differing conditions over the country.

It is the contention of the railroads that the agreements must be abolished if the railroads are to restore efficiency and cut down expenses to a proper relation to earnings as fixed by the established rates. The question was brought to a head on January 31 when General W. W. Atterbury, vice-president of the Pennsylvania System, testified before the board. Mr. Atterbury predicted bankruptcy for many of the roads and resultant national panics unless steps were taken immediately to reduce payrolls and bring operating expenses into proper relation to the operating revenue. From the standpoint of the maintenance of way department, his statement was particularly pertinent because he requested that the board give the railroads the right to set the wages of common labor at not less than the prevailing rate in the various territories served by any carrier.

THE MAINTENANCE OF WAY AGREEMENT

The opposition of the railroads to the National agreements with particular regard to the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers was taken up on the same day, being presented by E. T. Whiter, chairman of the conference committee of managers of the Association of Railway Executives.

In this testimony Mr. Whiter first pointed out that this organization, unlike the Shop Crafts, have asked the Board to sanction a new and more restrictive national agreement instead of asking for the continuation of the one now in effect by the terms of the Transportation Act and a subsequent ruling of the Labor Board. The opposition of the railroads against the proposed agreement is based, according to Mr. Whiter's testimony, on seven specific objections. These objections are:

(1) The proposed rules extend their scope to classes of employees not heretofore represented by this organization; to many who are not employed in the maintenance of way department by all railroads.

(2) The proposed rules are intended to be applied to officers; or to men who may be represented by other organizations.

(3) There are vague and conflicting rules.

(4) Some of the proposed rules are impracticable of application or contain requirements which involve unnecessary work.

(5) The proposed rules will result in a reduction of efficiency and productivity of the employees.

(6) The proposed rules would prevent the giving to incapacitated employees employment suited to their capacity.

(7) The proposed rules effect a further increase in earnings for work performed; also pay for time in which no work is performed.

Among the many features of the proposed "National Agreement" for the maintenance of way employees to which objection has been raised is the new clause covering promotion, which reads as follows:

> Basis of Promotions.—Section 1. Promotions shall be based on ability, merit and seniority, ability and merit being sufficient, seniority shall prevail. If question arises as to employee's ability to fill a position a committee of three employees appointed by the general chairman or vice-chairman of the U. B. M. W. E. & R. S. L., together with a like committee appointed by the management, shall investigate and make decision on question involved.

This is followed by other clauses establishing an elaborate system for bulletining, transferring, etc., with provision that the rule covers temporary as well as permanent positions. Attention is drawn also to the fact that the clause of the old agreement excluding the position of watchman from the operation of the rules has been omitted from the proposed agreement.

Some of the objections raised are quoted below:

"Positions of track, bridge and highway crossing watchmen and similar positions should not be subject to seniority rules. The service demands that the management shall have the widest latitude in the exercise of its best judgment in filling such positions or making changes therein that might be occasioned if seniority rights were asserted, and any restriction of this latitude will lead to inefficiency.

"These positions in the past have been filled by employees disabled in any branch of the service, and it is improper to give to employees in one department the right to fill such positions through the application of seniority rules, and thus make it impossible for the disabled employees from other departments having the opportunity to work, notwithstanding they may be less disabled and better qualified for the positions.

"It is the practice to temporarily assign certain foremen to positions of extra gang foremen for comparatively short periods and for not more than the few months when seasonal extra gangs are put on. When the work is finished they return to their former positions. It would be undesirable to the management to be obliged to advertise such a temporary vacancy, which would result in an upsetting of the foremen in the spring and subsequent similar "bumping" in the fall. On the section where the foreman goes on extra gang duty, the local arrangements have been worked out for some time, frequently the assistant foreman becoming the section foreman during such time."

Among the clauses covering compensation for work done under special conditions is the following in the proposed agreements:

> Reporting and Not Used.—Section 15. Employees required to report at usual starting time and place for the day's work, and when conditions prevent work being performed, shall be allowed a minimum of five hours. If required to perform work, shall be paid for full day.

The following paragraph in the corresponding clause of the old agreement was omitted:

> Employees whose regular assignment is less than three hours, are not covered by this rule. (This paragraph is to cover regular assignments, such as care of switch lamps or other duties requiring short periods on Sundays or other days for special purposes.)

The comment on this is given in part:

"The proposed rules are so worded that it will readily be seen that on any day a maintenance of way employee works at all he would be paid a minimum of eight hours even if he only works a few minutes.

"If the starting time is 7:00 o'clock in the morning, and conditions at that time prevent work being done, and the employee has reported for work, but is not put to work, he must be paid five hours, but if five minutes of work is done, and then work is stopped for the day, and the employee goes home, the full eight hours' pay must be allowed."

Appeal to the President

Later developments coming as a direct consequence of General Atterbury's statement took the form of an appeal to President Wilson on the part of the labor leaders. A long telegram signed by B. M. Jewell, president of the railway employees department of the American Federation of Labor, and the presidents of six of the mechanical and car department brotherhoods, was sent to the President on the evening of January 31. In this the signers contended that the present predicament of the roads is a situation largely of their own making and that the prime object is to break the power of the brotherhoods. A list of 10 charges were tabulated in the message which appealed to the President to take immediate steps to have all the evidence in the case presented to the Interstate Commerce Commission. It is stated further that the unions were calling his attention to the matter only because "no stone should be left unturned to prevent such a catastrophe as outlined by Gen. Atterbury." Word was received in Chicago on February 1 that President Wilson had received the telegram and had taken the matter under advisement.

Later on the same day the railway executives sent a message to the President answering the charges of the unions, stating in part as follows:

"They are propaganda intended to discredit private management of railroads in the interests of the Plumb plan and to defeat efforts to abolish rules and working conditions which were adopted as war measures, the continuance of which is causing inefficiency and waste in railway operation costing hundreds of millions of dollars.

"The charge that the railroads of the country are controlled by a single banking group in New York is untrue and is known to be untrue.

"The charge that since the resumption of private operation inefficiency and lack of economy have been deliberately encouraged is conclusively disproved by the record from March 1 to the end of 1920."

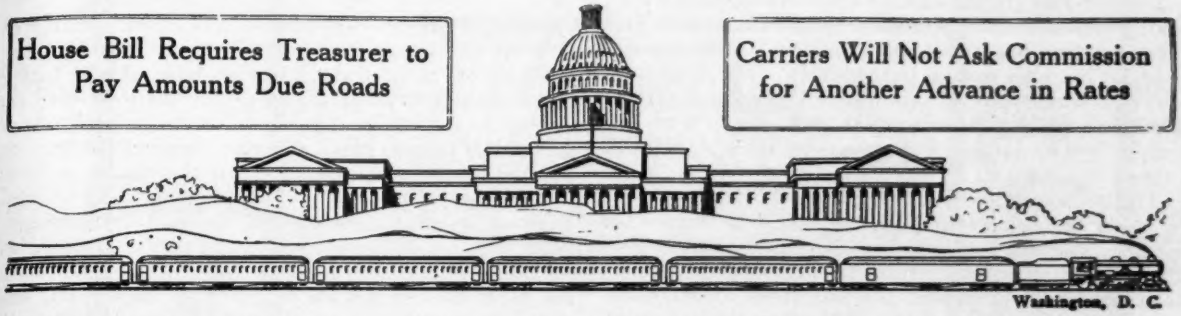
Another consequence of the Monday session of the Labor Board was a decision of the board to take prompt action on the plea of the railway executives to abrogate the National agreements immediately. A meeting was scheduled for February 3, when the board will hear the labor leaders in opposition to this proposal.

In the meantime a number of roads have taken steps to reduce wages. The Erie is reported to have made cuts that bring the rate for maintenance of way laborers down to from 30 to 38 cents.

RAILWAY AFFAIRS AT THE NATION'S CAPITAL

House Bill Requires Treasurer to Pay Amounts Due Roads

Carriers Will Not Ask Commission for Another Advance in Rates



Washington, D. C.

THE BUSINESS depression and the resultant falling off of railway traffic, combined with the action of the Treasury Department in withholding a large part of the guaranty for the six months following the termination of federal control, has deprived the railroads of most of the benefits they were expected to receive from the rate advance and again placed the roads in a precarious condition, resulting in sharp reductions in forces and curtailment of purchases. Instead of providing a six per cent return, the net operating income of the roads of the United States for the first three months after the new rates were put in effect, September, October and November, were on an average basis of only 4.1 per cent on the valuation adopted by the commission for the purposes of the rate case, and the December returns, which are not yet completely available, are making an even worse showing.

In an effort to improve their cash situation and meet pressing bills a delegation of railroad executives headed by Thomas De Witt Cuyler, chairman of the Association of Railway Executives, appeared before the House committee on interstate and foreign commerce on January 14 to urge the passage of a bill introduced by Representative Winslow to require the Secretary of the Treasury to honor certificates of the Interstate Commerce Commission for partial payments on account of the six months' guaranty, for amounts found by the commission to be certainly due, without waiting the protracted process of a final adjustment of the accounts. The exact amount of the guaranty cannot be determined at this time because the Interstate Commerce Commission has not yet determined how much is properly chargeable to the guaranty period for maintenance expenses and also claims for loss and damage and personal injuries may yet be filed, which will affect the result. Mr. Winslow's bill would make the Transportation Act clearly provide what the commission and the railroads had assumed it originally intended.

Will Not Make Partial Payments

The commission has issued certificates, which have been paid by the Treasury Department, for approximately $264,000,000 of the guaranty in the form of advances applied for by the roads up to September 1, but when the commission issued additional certificates for partial payments on account they were held up in the Treasury Department under a decision by the comptroller of the Treasury that only certificates for the finally ascertained amount could be paid and the Supreme Court of the District of Columbia has sustained the comptroller's ruling by declining to issue a writ of mandamus applied for by the Grand Trunk Western in a test case. The case has been appealed to the court of appeals and will eventually go to the Supreme Court, but it was explained by the railroad officers at the hearing that the situation will not wait for such a proceeding as many of the roads are in dire need of the funds at the present time.

Chairman Clark of the Interstate Commerce Commission, who also advocated the passage of the bill, said it was estimated that the amount still due the carriers is approximately $367,000,000. President Rea of the Pennsylvania, President Willard of the Baltimore & Ohio, and other railroad officers testified as to the large amounts of bills for materials and supplies which they are unable to pay and the large amounts of traffic balances due from one road to another, while representatives of the coal companies and of the dealers in material and supplies testified as to the serious effect on their business resulting from the holding up of payments by the railroads. Frank W. Noxon, secretary of the Railway Business Association, said that if the government would release this fund it would be distributed through business channels in such a way that its effect would be multiplied ten-fold, because the companies to which the railroads owe money in turn owe money to their creditors and the entire situation is having a serious effect on credits as well as making it difficult for the supply concerns to keep their organizations together during the short period which they believe will elapse before there is a resumption of business activity.

Will Not Ask Higher Rates

Although the effect of the increase in freight rates has been disappointing, the railroads have announced through the Association of Railway Executives that they have no idea of asking for further increases in rates, but will bend their energies toward making existing rates adequate by economies in operating expenses, hoping that with a general reduction in prices and the increased traffic, which seems to be generally expected within a few months, they will find the existing rate level is sufficient. A good many of the habitual critics of the railroads have been criticizing in advance the idea of any further increases in rates, on the assumption that the railroads would make such a proposal as soon as it was demonstrated that the existing rates were not producing the expected return. Chairman Clark of the Interstate Commerce Commission, however, replied to a Congressman who suggested this idea at a recent hearing, that the Interstate Commerce Commission was not required under the Transportation Act to establish any given scale of rates, but to prescribe rates calculated to produce "as nearly as may be" a given sum of money as net operating income. Mr. Clark said that if the commission felt that a further increase in rates would tend to reduce the traffic rather than to increase revenue, it manifestly would not be its duty to make any further advance in rates.

The extent to which railroad traffic has been reduced is indicated by the fact that the number of carloads of revenue freight loaded in the week ended January 8 was

only 706,413, whereas during one week in October 1,010,961 cars were loaded. The loading for the week of Jatnuary 8 was greater than for the two preceding weeks, which were subnormal because of the Christmas and New Year holidays, but it was approximately 90,000 cars less than for the week ending December 18. The freight car shortage which existed throughout the greater part of 1920 gave place to a car surplus about the first of November and by January 8 there was a surplus of 258,000 cars.

The net ton miles of freight handled by the railroads in November aggregated 37,458,624,000, according to the monthly summary compiled by the Bureau of Railway Economics. This was approximately 5,000,000,000 less than the total for October, but was about 5,000,000,000 more than that for November, 1919, when the coal strike was in progress, 2,000,000,000 more than that for November, 1918, and 1,000,000,000 more than that for November, 1917.

The average mileage per car per day for November was 26.8, which was greater than that for November of the three preceding years, but was less than the average made in August, September or October, 1920. The average carload, however, established a new record, 30.5 tons. The best previous record for the year was 30.1 tons in September. The Railroad Administration had reported an average of 30.4 in August, 1918.

LOAN FUND NEARLY EXHAUSTED

The Interstate Commerce Commission on January 11 issued a statement giving the status of the revolving fund created by section 210 of the Transportation Act for the purpose of enabling the railroads properly to serve the public during the transition period immediately following the termination of federal control. The amount of the fund is $300,00,000 and it has been commonly referred to as the $300,000,000 loan fund, but $40,000,000 of the total has been reserved temporarily to meet claims and judgments arising out of operations during the period of federal control, leaving only $260,000,000 available for loans.

The total of loans approved by the commission as of December 31 was $205,721,357 and some additional certificates have been made by the commission since the first of the year. Up to January 14, according to a statement issued by the Treasury Department, it had actually paid out to the carriers $175,904,937 of this amount to 35 different roads. On December 31 the commission had pending applications for loans aggregating $51,653,594, leaving only $2,625,049 of the revolving fund available for additional loans, although there will be credits of interest and repayments of principal, which credits will be available for still further loans.

PROPOSED AMENDMENT OF VALUATION LAW

P. F. Farrell, chief counsel for the Interstate Commerce Commission, and J. E. Benton, solicitor for the National Association of Railway and Utilities Commissioners, testified at a hearing before the House committee on interstate and foreign commerce on January 20, advocating the passage of a bill introduced by Representative Esch to amend the valuation act of 1913 by striking out the requirement that the Interstate Commerce Commission shall report the original and present cost of acquisition of land separately from the original or present cost of the land itself. Mr. Farrell contended that the item referred to is impossible of ascertainment in connection with a report of the cost of reproduction new, while Mr. Benton's argument was directed particularly against including in a valuation any such allowance if it can be ascertained.

HOW AN OLD TURNTABLE WAS REPLACED

AN INTERESTING method was recently employed in the replacement of a 70-ft. deck girder turntable by an 80-ft. through girder table at the roundhouse of the International & Great Northern at Palestine, Texas.

As this is the most important engine terminal on this railway, it was imperative that the change be made in the least possible time. That the measures adopted were successful is indicated by the fact that the new table was placed in position and ready for operation within 16 hours from the time the old table was taken out of service and that the movement of engines into and out of the roundhouse was discontinued but 18 hours. A brief description of the work and methods used is given below:

The first step consisted of the construction of the new concrete circle wall with pit floor extension, about five feet outside of the old circle wall, maintaining the operation of all radial tracks at the same time. Extensions were then made out of rails, well reinforced, which, when fitted to the rails on the old table, would reach and rest upon the new circle wall. The wooden curbing was next removed from the old circle wall, the rails in the radial tracks were cut back and rail extensions placed on the table. The operation of the 70-ft. table was then continued in the 80-ft. pit.

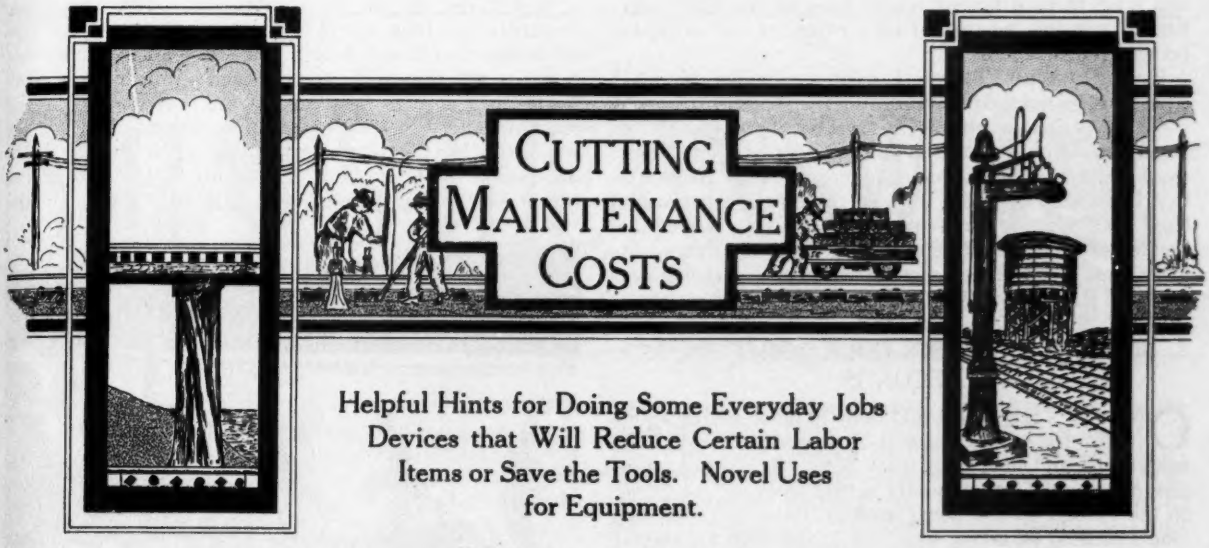
The necessary elevation of the concrete foundation for the center of the new table was nearly two feet higher than the top of the old foundation. To make up this difference in height a pre-cast, octagonal-shape, reinforced concrete block, having a thickness of two feet and a diameter of five feet, was built. It was provided with anchor bolts and electric conduit pipe set in place. Four small pipes were also set extending through this block, by means of which drills were later used in drilling down into the old foundation.

In the meantime the old circle wall was broken down by the use of small charges of dynamite and the new circle rail was placed in position. The new table was completely assembled, deck and rails laid and the table placed, carefully centered, on a flat car. This completed the preliminary preparations for the actual exchange of tables.

The car loaded with the new table was then run onto the old table, which was set at right angles to the direction in which it was intended to remove the old table. By removing the rail extensions on each end of the old table, space was provided for the placing of framed bents previously prepared, and upon these bents the new table was rested. The old table was then turned through a quarter circle, the empty flat car removed and the table quickly taken out of the pit by a locomotive derrick by sliding the table on an inclined skidway.

The old concrete center foundation was then cut down and leveled to the required elevation to receive the pre-cast concrete block. The block was lowered into the pit, slung from the under side of the new table and set in place, melted sulphur being used for a thin grouting. Holes were drilled in the old foundation, steel dowel pins placed and the holes filled with sulphur, thereby securely tying the block to the old foundation. As soon as the center castings were in position the new table was lowered into the pit by the locomotive derrick, and was ready for operation.

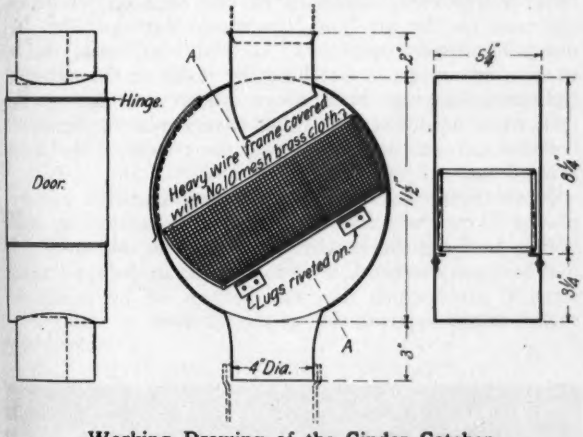
The work was done by the railway's forces under the personal supervision of F. S. Schwinn, chief engineer. R. E. Caudle, division engineer, directed the field work.



Helpful Hints for Doing Some Everyday Jobs Devices that Will Reduce Certain Labor Items or Save the Tools. Novel Uses for Equipment.

CINDER CATCHER PREVENTS CLOGGING OF DRAIN PIPES

THE Nashville, Chattanooga & St. Louis provides a unique cinder catcher on the downspouts of buildings located near running tracks. It is intended to prevent accumulation in traps and underground pipe leading from downspouts of buildings and is giving satisfactory results. The device consists of a cylindrical sheet metal drum 11½ in. in diameter and 5¼ in. wide, set



Working Drawing of the Cinder Catcher

in the downspout just above the point where the spout connects with the underground pipe. This drum contains a wire basket that serves to screen the water passing down the spout. The small hinged door shown in the drawing is intended for inspection and when the wire basket inside has become clogged with stack cinder and trash, it is easily removed and cleaned by turning upside down.

The cost, when constructed singly, at present prices, is about $5, but in lots of one dozen the cost is about $4. This may appear expensive, but it is not nearly so expensive as digging up underground pipes to be cleaned. The device has proved effective and when not carefully looked after and cleaned by the attendants at the stations, it overflows on the platform through the hinged door, thus giving effective notice of the attention needed. The wire basket is placed on the incline because, if laid level, the cinders would spread over the entire bottom quickly and block the passage of the water.

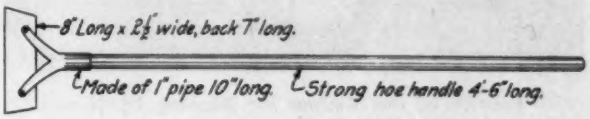
We are indebted to Hunter McDonald, chief engineer of the Nashville, Chattanooga & St. Louis, Nashville, Tenn., for the information concerning this device.

GET READY TO SWAT THE WEEDS NEXT SUMMER

By C. S. Lusk

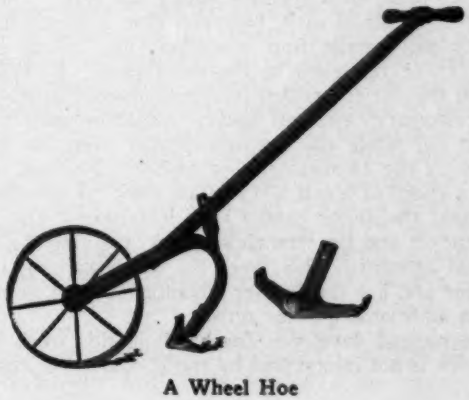
Section Foreman, Erie, Alfred Station, N. Y.

ONE OF THE summer problems in track maintenance is weeding and the only tool ordinarily furnished in the regular equipment is shovels. For several years I have used a special scuffle hoe made by a blacksmith. The



A Home-Made Scuffle Hoe

blades are made of a crosscut saw blade cut 2¼ in. wide and 8 in. long on the cutting edge by 7 in. on the back edge. A piece of 1 in. pipe 10 in. long is made flat half its length. The flat part is split about 4½ in. and spread to form a "Y," the spread ends of the "Y" being drilled to rivet to the blade which is drilled for rivets. The "Y" is bent to an angle that will leave the blade level. A strong hoe handle 4½ ft. long is placed in the socket. Two men equipped with these tools can do as much as three men with shovels and do it easier. I have secured



A Wheel Hoe

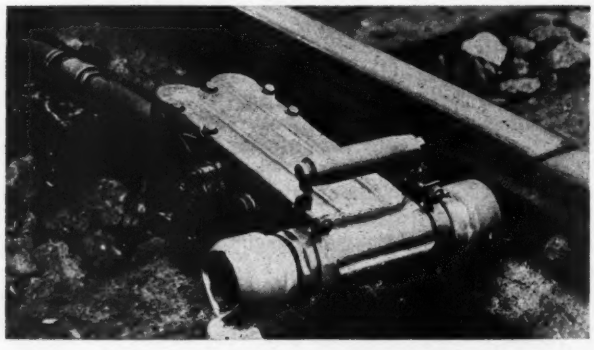
and tried three different scuffle hoes of the light, long-handle type and they are of little value for our work, not being strong enough.

During the past season I used a Simplex No. A-3 wheel scuffle hoe manufactured by the American Fork & Hoe Company, Cleveland, Ohio, to do the weeding from grass lines to ends of ties in cinder and gravel ballast and from grass to ballast along stone and slag. With this tool I was able to do the work of three or four men with hand scuffle hoes or five or six with shovels. The hand scuffle hoes were used between the ties and cleaning up. The wheel scuffle hoe is especially useful in weeding surface and standard ditches when dry.

BOLTING UP A SIX-HOLE JOINT IN 30 SECONDS

ONE OF THE recent additions to labor-saving equipment for railway use is a pneumatic wrench for running up and tightening track bolts. This machine received its initial tryout under actual working conditions on the Lehigh Valley, being used in connection with that road's method of laying new 136-lb. rail with locomotive cranes. During this work average cycles of 30 sec. were maintained in bolting 6-hole continuous splices.

The machine used is an adaptation of one of the "close



Position of the Machine for Running Up Nuts

quarter" drills as manufactured by the Ingersoll-Rand Company, New York. In order to utilize it for a wrench a new spindle was built into the machine, each end of which carries a socket wrench. These sockets are interchangeable and are made in different sizes in order that any standard shape of nut can be handled. The power is supplied in the usual manner by compressed air, the application being controlled by a valve in the handle.

In using this wrench in field work the joints are placed in position, the bolts inserted and the nuts started by hand in the usual manner. Two machines are generally used per joint, each operator taking one side. The consumption of air is such, however, that a standard compressor will handle four wrenches, thus allowing two joints to be tightened at the same time. In order to tighten the nut the socket is slipped over it in the manner customary with all socket wrenches and the air turned on, while the machine proper rests on and is braced by the adjacent ties or ballast. The nut is run up at a speed of about 170 r. p. m. until the resistance is such that the motor cannot turn it farther. The air is then cut off and the wrench released by giving it a quarter pull upward. This frees the air remaining in the machine and has the further advantage of tightening the nut an additional quarter turn.

One method developed for handling this work where the work is not interrupted by traffic consists of coupling a motor car to an air compressor. The pneumatic wrenches are then connected to the compressor by two air hoses of sufficient length to allow plenty of free motion. In addition to the wrench men a third man is used, whose duty it is to take care of the hose in moving the machine ahead in order that connections may not be weakened by the workmen pulling upon them and to insure that the hose is not damaged by the wheels of the compressor. This arrangement materially speeds up the

A Pneumatic Wrench in Operation

work, as the motor car operator can move the coupled unit ahead without any loss in time to the men working with the wrenches. The unit force thus developed consists of five men, composed of two men on wrenches, one man on the air hose, one motor car operator and one compressor operator. An additional man can be used to advantage in watching the joints as the nuts are tightened, tapping them into a better seat against the rails when needed, and in other cases replacing defective bolts or nuts as they show up in the course of the work being done.

In the before mentioned trial installation this unit replaced 30 men who had been engaged in tightening track bolts. In using this machine for removing old nuts it is first necessary to break them loose with an ordinary track wrench, after which they can be run off by using the socket on the opposite side of the machine.

A Tie Operation on the West Coast

THE OBJECT of this department of the *Railway Maintenance Engineer,* which made its first appearance last month was explained in detail in the January issue. Briefly, the purpose is to provide a clearing house for the solution of questions or problems submitted by the readers concerning their work in the maintenance of way department of the railroads. It is the desire of the editor that readers participate in this department, both in sending in questions and in supplying answers to the questions submitted.

Any question concerning any practical problem encountered in the ordinary maintenance of way work, particularly in track, bridge, building and water service work, will be considered. Answers must reach the editor not later than the 18th of the month preceding the date of the second issue after the one in which the question is published in order to appear. Address all questions or answers to the Editor, The *Railway Maintenance Engineer,* 608 South Dearborn street, Chicago.

The following questions have been submitted for answer in the April issue:

(1) What advantage is there, if any, of considering one of the track rails as the "line" rail?

(2) Should ties on a deck girder be sized or shimmed to take up the variation in the thickness of cover plates?

(3) What is the most practical protection for the floor under a station stove?

(4) What is the most serviceable device for the bottom of a wooden roadside tank to facilitate draining and cleaning?

Answers to four questions submitted last month appear below:

OUTSIDE BUILDING PAINTING

When and under what conditions is it advisable to paint the exterior of buildings?

Paint may be applied to the exterior of buildings at almost any temperature, but in my opinion the most satisfactory results may be obtained in temperatures ranging from 0 to 45 deg. F. The surfaces to be coated must be free of moisture, dirt, dust and scaling particles and the atmosphere dry. Should the temperature be near zero it is best to work on the sunny side of the building.

Painting in low temperature insures against adulterated materials. Thus, linseed oil does not congeal until the temperature is about 25 deg. below zero, whereas cottonseed oil becomes firm at 5 deg. above zero, water freezes at 32 deg. above zero and animal fats congeal at even higher temperatures. A limited amount of turpentine added to paint in frigid weather will aid in spreading the paint more uniformly. The turpentine is not injurious to the paint, but will evaporate after application has been made and leave the paint in its natural process. It also adds to or increases penetration.

The conditions in high temperature painting require the addition of more raw linseed oil to the paint. This will retard the drying process. Raw linseed oil acts just the opposite to boiled linseed oil. It dries from surface to base. Personal observations, time tests and experience have proven that it is advisable to do exterior painting of buildings in low temperature. There is less danger of the paint rupturing, it is more durable, there is less dust to contend with and one avoids the obnoxious midget flies which appear in swarms during hot months and deface the freshly coated surface.

F. C. RIEBOLDT, Foreman Painter, Chicago, Milwaukee & St. Paul, Milwaukee, Wis.

BRACING SHIMS

How can the higher track shims be braced to insure complete safety?

While shims having the same width as the rail and a length equal to the breadth of the average tie are commonly used for the lighter shimming, practice favors the use for the heavier shimming of shims having a standard design, at least 18 in. long and bored for the passage of the track spikes.

To insure complete safety special spikes should be used, which may be obtained up to 9 in. in length. The canting of the rail may be prevented by applying a hardwood rail brace fitting snugly against the web and the under side of the head, being held against the outward thrust by a shimming spike driven into the tie and protruding 1½ in. and against other displacement by a boat spike passing through the shim and into the tie. While broken angle bars are sometimes used for this purpose, the wooden brace is preferable. TRACKMAN.

CUTTING OFF CONCRETE PILES

What is the best way to cut off a reinforced concrete pile?

In the first place, concrete piles should be driven to avoid the necessity of cutting them off wherever practicable, and the design which involves their use should be such as to give an ample margin for variation in the penetration secured and the length of concrete piles used should be selected so that when the pile brings up, its head will be approximately at the proper elevation. In concrete trestles or in concrete foundations the design can usually be arranged to provide for one to two feet variation in the elevation of the head of the pile.

Where the head of a concrete pile comes above the permissible variation, it is cut off by chipping away the surface of the concrete with cold chisels so as to expose the reinforcing bars, which are then cut off with a hack saw. The cutting can better be done with an acetylene torch, but such equipment is not usually available at isolated jobs. Plugs and feathers can be used to wedge off the concrete core of the pile head.

L. D. HADWEN, Engineer Masonry Construction, Chicago, Milwaukee & St. Paul, Chicago.

DEFECTIVE TRACK TANK VALVE

What can be done to correct track tank valve which persists in getting out of order because of pounding that occurs when it is closing?

It is assumed that the valve in question is a balanced float controlled automatic valve and the pounding is evidently due to the valve closing too rapidly or with a jerky movement causing a water hammer to set up in the line. The cause of the valve closing too rapidly may be due to improper adjustment of the pilot valve or leakage by the valve piston and can be overcome by properly adjusting the pilot valve so that the proper amount of water will enter the balancing chamber. If it is due to leakage by the valve piston, properly packing the piston will overcome the trouble; if the trouble is due to a jerky or intermittent movement of the valve during closure it may be caused by corrosion of the valve piston or packing it too tight. This can be overcome by properly packing the piston and carefully cleaning the valve of all corrosion. It is also possible that surges in the track pan may have something to do with the closure, as violent surges would cause a rapid intermittent movement of the float, which would result in the valve pounding.

C. R. KNOWLES, Superintendent of Water Service, Illinois Central, Chicago.

ASSOCIATION ACTIVITIES

THE AMERICAN RAILWAY ENGINEERING ASSOCIATION

Arrangements are being completed for the convention of the American Railway Engineering Association on March 15-17, inclusive, and for the simultaneous exhibit of the National Railway Appliances Association at the Coliseum. With reports of practically all of the committees in the hands of the secretary, the bulletins of technical information to be presented at the March convention are being placed in the hands of the printer from day to day and will soon be sent out to the members for study. C. W. Kelly, secretary of the National Railway Appliances Association, reports that 5,500 square feet of additional space has been made available for the exhibits this year and that all but 12 spaces of the total display area available has been contracted for by the members of the association and with 22 applicants for the remaining space it is anticipated that the entire exhibit area will be taken up early in February. The Signal Division of the American Railway Association has decided to abandon its one day stated meeting in Chicago on March 14, but this will in no way affect the A. R. E. A. convention and N. R. A. A. exhibit scheduled for the same week.

The nominating committee of the American Railway Engineering Association has selected the following candidates for officers for the ensuing year:

President, L. A. Downs, vice-president and general manager, Central of Georgia, Savannah, Ga.; vice-president, E. H. Lee, vice-president and general manager, Chicago & Western Indiana, Chicago; secretary, E. H. Fritch, Chicago; treasurer, G. H. Bremner, district engineer, Bureau of Valuation, Interstate Commerce Commission.

Directors (three to be elected): A. M. Burt, assistant to vice-president—operation, Northern Pacific, St. Paul, Minn.; C. F. W. Felt, chief engineer, Atchison, Topeka & Santa Fe System, Chicago; J. V. Hanna, chief engineer, Kansas City Terminal, Kansas City, Mo.; F. G. Jonah, chief engineer, St. Louis-San Francisco, St. Louis, Mo.; B. H. Mann, signal engineer, Missouri Pacific, St. Louis, Mo.; G. J. Ray, chief engineer, Delaware, Lackawanna & Western, Hoboken, N. J.; A. O. Ridgway, assistant chief engineer, Denver & Rio Grande, Denver, Col.; H. L. Ripley, valuation engineer, New York, New Haven & Hartford, Boston, Mass.; George H. Webb, chief engineer, Michigan Central, Detroit, Mich.

Members of Nominating Committee (five to be elected): J. R. W. Ambrose, chief engineer, Toronto Terminals, Toronto, Ont.; R. H. Ford, assistant chief engineer, Chicago, Rock Island & Pacific, Chicago; E. A. Hadley, chief engineer, Missouri Pacific, St. Louis, Mo.; C. P. Howard, senior civil engineer, Bureau of Valuation, Interstate Commerce Commission, Chicago; R. H. Howard, chief engineer, maintenance of way, Wabash, St. Louis, Mo.; C. E. Johnston, general manager, Kansas City Southern, Kansas City, Mo.; A. Montzheimer, chief engineer, Elgin, Joliet & Eastern, Joliet, Ill.; J. V. Neubert, engineer, maintenance of way, New York Central, New York; Frank Ringer, chief engineer, Missouri, Kansas & Texas, St. Louis, Mo.; A. F. Robinson, bridge engineer, Atchison, Topeka & Santa Fe System, Chicago.

THE MATERIAL MARKET

THE MATERIAL market continues exceedingly quiet. The railroads apparently have completed their arrangements for rail requirements for 1921 and no new recent orders have been recorded. The United States Steel Corporation is continuing production at a fair rate, a condition made possible almost entirely by the accumulation of unfilled orders, but this is being rapidly depleted. The independent manufacturers are operating on a much more restricted basis. Under such circumstances it is not surprising that there has been some shading below the prices recently established. This has been the case with structural material, tie plates and cast iron pipe, but such reductions have not been sufficiently definite to warrant listing. Consequently, the present prices quoted in the table below are the same as those given last month:

	Prices in Cents Per Pound			
	December 30		January 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$3.65	$4.03	$3.65	$4.03
Track bolts	.....	4.98	.....	4.98
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	.....	3.00	.....	3.00
Tie plates, iron	.....	3.00	.....	3.00
Plain wire	3.25	3.63	3.25	3.63
Wire nails	3.25	3.63	3.25	3.63
Barbed wire, galv.	3.95	4.33	3.95	4.33
C. I. pipe, 6 in. or larger (per ton)	.....	64.10	.....	64.10
Plates	2.65	3.03	2.65	3.03
Shapes	2.45	2.83	2.45	2.83
Bars (steel)	2.35	2.73	2.35	2.73

Changes in the case of scrap and second-hand material have been less marked than during the month previous, the only appreciable reduction having taken place in the case of relaying rails.

	Per Gross Ton	
	Chicago	St. Louis
Relaying rails	$37.50 to $42.50	$35.00 to $40.00
Rerolling rails	15.50 to 16.00	17.00 to 17.50
Rails less than 3 ft. long	16.50 to 17.00	15.00 to 15.50
Frogs and switches, cut apart	15.00 to 15.50	15.00 to 15.50
	Per Net Ton	
No. 1 railroad wrought	13.50 to 14.00	13.50 to 14.00
Steel angle bars	15.00 to 15.50	13.00 to 13.50

The price of Portland cement, which has experienced no change for some time, is still stationary.

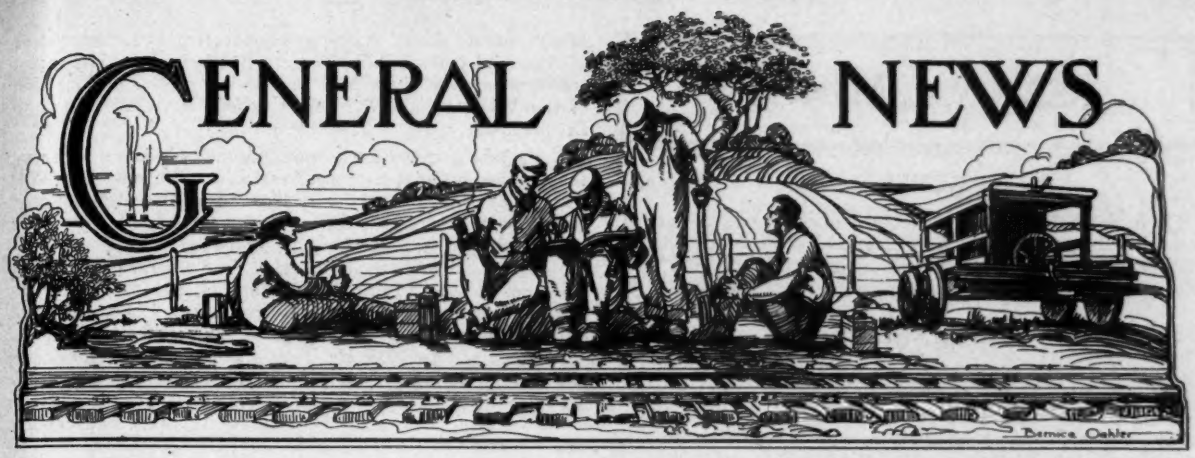
A review of the lumber market shows that there has been a further decline in the prices of Southern pine ranging from $0.50 to $3 or more, but the prices for Douglas fir have remained approximately stationary.

Southern Pine Mill Prices

	December	January
Flooring, 1x4, B & B flat	$43.82	$37.85
Boards, 1x8, 14 & 16, No. 1	29.02	28.50
Dimension, 2x4, 16, No. 1	22.93	20.31
Dimension, 2x10, 16, No. 1	23.95	20.31
Timbers, 4x4 to 8x8, No. 1	28.65	26.76
Timbers, 3x12 to 12x12, No. 1	38.96	37.50

Douglas Fir Seattle Prices

Flooring, 1x4, No. 2, clear, flat	29.00	29.00
Boards, 1x6, 6 to 20, No. 1, common	16.50	16.50
Dimension, 2x4, 16, No. 1, common	15.50	15.50
Dimension, 2x10, 16, No. 1, common	15.50	15.50
Timbers, 6x6 to 8x8, No. 1, common	23.00	23.00
Timbers, 10x10 to 12x12, No. 1, common	26.00	26.00



The Louisville & Nashville has bought wireless telegraph apparatus to be installed at Louisville, Ky.; New Orleans, La.; Mobile, Ala., and Pensacola, Fla.

President Obregon, of Mexico, has decided to investigate the general railroad problem, with a view to formulating propositions for the return of the railways, by the government, to their owners.

The Associated General Contractors of America held their second National Conference at New Orleans, La., on January 25-27, inclusive. The deliberations of this convention included those of a railroad section that discussed the relation of the contractors to the railroads.

The Atchison, Topeka & Santa Fe on January 10, withdrew from its joint use of the Oakland Mole terminal of the Southern Pacific, and its trains now run to and from its own terminal at Ferry Point, Richmond. The withdrawal was made possible by the revocation of the order of the Railroad Commission of California that the Santa Fe must remain at the Oakland Mole.

The Louisville & Nashville in a decision recently reached by the Louisiana Railroad Commission is ordered to begin construction of new bridges over Chef Menteur and Rigolets Pass on the Gulf Coast southeast of Lake Borgne by July 1, 1921. Although the commission decided that the bridges are safe, the above decision was reached in order to hasten replacement by permanent structures.

Dr. William Robinson, inventor of the closed track circuit, the distinctive essential element in the automatic block signal system used on all the important railroads of the United States, died at the Muncie Sanitarium in Brooklyn, N. Y., on Sunday, January 2, at the age of 80. He was an inventor in many fields and is credited with an electric welding process and the coaster brake for bicycles.

Peter Bronski and S. Kalonowsky, section men on the Chicago & Erie, were presented with $50 each as a reward for their honesty in turning over to the proper authorities four bags containing Liberty Bonds, drafts, leases, wills, notes and certificates of deposit valued at approximately $500,000, which they found near the track at Highlands, Ind. The property had been stolen from the National Bank of Clifton, Ill., on the night of November 19.

"The Future Supply of Ties" was the subject of an address given before the Western Society of Engineers on Friday evening, January 14, by John Foley, forester, Pennsylvania System. This meeting constituted the initial step in the tour made by the members of the Wood-Preservers' Association on their way to the convention of that association which is reported elsewhere in this issue. The meeting was attended by a considerable number of the members of this association.

The annual meeting of the American Society of Civil Engineers was held on January 19 and 20 at the headquarters of that society, 33 West Thirty-Ninth street, New York. Chief among the business appearing before that meeting was the presentation and counting of the ballots for the annual election of officers for which a second or opposition ticket had been presented some time previous. The results of the election gave a majority to the original ticket and the following men were elected: President, George S. Webster, Philadelphia, Pa.; vice-presidents, Andrew M. Hunt, New York, and Edward E. Wall, St. Louis, Mo.; treasurer, O. E. Hovey, New York; for directors, Dist. 1, J. P. Hogan and Ira W. McConnell, New York; Dist. 4, R. L. Humphrey, Philadelphia, Pa.; Dist. 9, B. L. Brown, St. Louis, Mo.; Dist. 10, Frank T. Darrow, Lincoln, Neb., and Dist. 11, G. G. Anderson, Los Angeles, Cal.

One thousand safety workers on the Chicago & North Western, members of 85 safety committees of the road, gathered at luncheon on January 15 in Chicago, to honor R. C. Richards, general claim agent, and chairman of the Central Supply Committee of that road. Mr. Richards, who is 66 years old, is the pioneer in "safety first" on American railways, having inaugurated safety work on the Chicago & North Western in 1910. He has since taken a leading part in safety work on American railways. At the luncheon Mr. Richards was presented with a silver service by his associates.

Automobile drivers to the number of 3,886 were warned during the month of October by Pennsylvania Railroad watchers, assigned to grade crossings to check up careless people. These warnings were served through officers of the states of New Jersey and Pennsylvania. These watchers consumed a total of 3,043 hours of time in their work, and it appears that 8.7 per cent of all automobilists driving over grade crossings failed to observe proper caution. The railroad's campaign was begun last July and has been conducted in co-operation with the commissioner of highways of Pennsylvania and the commissioner of motor vehicles of New Jersey.

Correction—The article on Results of Water Treatment, appearing in the Railway Maintenance Engineer for January, contains a reference on page 20 to a water treating plant now being built at Valley Junction, Ia., stating that this softener was of the same type as that in service at Armourdale, Kan. We are advised that the similarity of these two plants applies only to the general scheme of tankage in the matter of handling the water between the top of the softener and the bottom of the storage tank. It does not in any way concern the type or particular make of chemical mixing apparatus. These are of different makes and of essentially different character in the two plants.

The Hudson River Bridge Corporation has been organized in New York and incorporation papers were filed in Albany on January 18. The capital for the present is $251,000. The corporation has been organized to promote the construction of a bridge from the design which has been made by Gustav Lindenthal, engineer for the Hell Gate bridge. The entire plan, which includes terminals in Manhattan and large railroad yards in New Jersey, it is estimated will cost $200,000,000. The proposed bridge would accommodate both railroad and highway traffic; it would have 14 tracks and a capacity equal to that of 20 tunnels, while its estimated cost is less than one half as much as the cost of that number of tunnels.

PERSONAL MENTION

GENERAL

J. A. Nichols, assistant engineer maintenance of way of the St. Louis division of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Mattoon, Ill., has been appointed assistant trainmaster on the same division.

ENGINEERING

S. Morrison, acting district engineer on the Canadian National, Western Lines, with headquarters at Vancouver, B. C., has been appointed assistant engineer maintenance of way, with the same headquarters, with jurisdiction over all lines west of Edmonton, Alta., and including Vancouver Island lines. The position of district engineer, Pacific district, has been abolished.

George W. Boschke, consulting engineer, has been appointed assistant chief engineer of the Southern Pacific, with headquarters at San Francisco. Mr. Boschke was born at Boston, Mass., on October 10, 1864, and received his education at Wilson College. He entered railway service in 1886 in the engineering department of the Southern Pacific, where he was engaged on various construction projects, including the Portland route in the vicinity of Mt. Shasta, the coast division in the vicinity of Ellwood, and Southern Pacific terminals at Galveston, Tex. While in Galveston, he was engaged by the city of Galveston, with the consent of the railroad, to supervise the construction of the Galveston seawall. In April, 1905, he became chief engineer of the Oregon-Washington Railroad & Navigation Company and engineer of the maintenance of the Southern Pacific Company's Lines in Oregon. Upon leaving this company, Mr. Boschke began practicing as a consulting engineer, in which capacity he was engaged at the time of his recent appointment.

E. J. Henriques, whose appointment to the position of office engineer of the Mobile & Ohio, with headquarters at St. Louis, Mo., was noted in last month's issue, was born at Marshalltown, Ia., on November 23, 1881. He received his education at Lewis Institute and entered railway service with the Pennsylvania at the Herr Island Stock Yard in July, 1901. From this date until December, 1904, he served in various capacities on different parts of the system. From December, 1904, until June, 1906, Mr. Henriques was employed as chief engineer of the Cuba Fruit Company, Cuba, returning to the Pennsylvania at the latter date. In September, 1907, he became assistant city engineer of Fargo, N. D., leaving in April, 1910, to go with the Lytle Construction Company, Sioux City, Iowa. He worked in Honduras, C. A., from October, 1913, to February, 1915, and from the latter date until December, 1917, was engaged in highway work in Mississippi and Louisiana. In December, 1917, Mr. Henriques was appointed assistant engineer of the Mobile & Ohio, leaving in September, 1919, to engage in highway work at Meridian, Miss., where he was employed at the time of his recent appointment.

H. F. McFarland, Jr., whose appointment as chief engineer of the Wichita Falls & Southern, with headquarters at Graham, Tex., was announced in the January issue, was born on April 2, 1885, at Corsicana, Tex. He was educated at Washington University and entered railway service in 1908 as an inspector of bridge and masonry construction on the St. Louis-San Francisco. In July, 1909, he was made senior draftsman in the office of the engineer of bridges, and in December, 1912, he was promoted to assistant engineer with jurisdiction over the general design of steel and concrete structures. Mr. McFarland enlisted in the army in June, 1918, being commissioned lieutenant and assigned to the Twelfth Engineers. He was later promoted to captain and served in France until June, 1919. In July, 1919, upon his return to civil life, Mr. McFarland accepted an appointment as chief engineer of the Wichita Falls, Ranger & Fort Worth, taking direct charge of the location and construction of that road from Dublin, Tex., to Breckenridge. His recent appointment has given him supervision of the construction of the Wichita Falls & Southern from Newcastle, Tex., to Breckenridge.

J. V. Johnston, whose promotion to division engineer on the Mobile & Ohio, with headquarters at Murphysboro, Ill., was announced in the January issue, was born at Coldwater, Miss., on September 4, 1890. He received his education at the Mississippi A. and M. College and entered railway service as an instrumentman for the New Orleans, Mobile & Chicago, in 1911. From 1913 until 1914, he served as engineer of construction for the Laurel, Miss., Light and Railway Company, in the latter year becoming city engineer of Laurel, Miss. In 1915 Mr. Johnston entered the service of the Mobile & Ohio as land engineer in which capacity he served until May, 1917, when he entered the United States Army, serving consecutively as first lieutenant and captain. He returned to the Mobile & Ohio in September, 1919, as draftsman, and was promoted to assistant to bridge engineer in December, 1919, which position he held at the time of his recent promotion.

TRACK

P. C. Connelly, roadmaster on the Western Pacific, with headquarters at Oakland, Cal., has been appointed general roadmaster, with the same headquarters, with jurisdiction over the entire line.

S. H. Morgan, assistant roadmaster of the Coster division of the Southern Railway, has been appointed roadmaster of that division, with headquarters at Knoxville, Tenn., succeeding **J. P. Hannah,** deceased. The position of assistant roadmaster has been abolished.

C. Duckworth, formerly appointed division engineer on the eastern division of the Western Pacific, with headquarters at Elko, Nev., has resumed his position as roadmaster, with the same headquarters, effective January 1, the position of division engineer having been abolished.

J. F. Smith, extra gang foreman on the Missouri Pacific, has been promoted to roadmaster of the Little Rock terminals, with headquarters at North Little Rock, Ark., succeeding **M. Leonard,** who has been transferred to the district extending from Bald Knob to Hoxie, with headquarters at Newport, Ark., in place of **C. W. McCollum,** transferred.

John Flanigan, whose promotion to roadmaster of the Des Moines division of the Chicago, Milwaukee & St. Paul, with headquarters at Des Moines, Ia., was noted in last month's issue, was born in Ireland on March 12, 1870. He entered railway service as a laborer and water boy for the Chicago, Milwaukee & St. Paul in May, 1882, serving subsequently as section foreman and construction foreman. In 1915 Mr. Flanigan was promoted to assistant roadmaster, which position he held at the time of his recent promotion.

Archer P. Crosley, assistant supervisor of the Philadelphia & Reading at Trenton Junction, N. J., has been promoted to supervisor, with headquarters at Coatesville, Pa., succeeding **Charles J. Lepperd,** who has been transferred to Pottstown, Pa., to succeed **T. McEvoy,** resigned. **F. W. Biltz,** assistant supervisor of the Wilmington and Columbia division, has been transferred to Trenton Junction succeeding Mr. Crosley. Mr. Crosley was born at Merchantville, N. J., on August 11, 1893, and was graduated from Cornell University in 1916. He entered railroad service in February, 1917, as rodman in the chief engineer's office of the Philadelphia & Reading, being located at Philadelphia, Pa., having served as a rodman for this company during several summer vacations. In July, 1917, he was made levelman at the same place, and was promoted to assistant supervisor of the New York division in the office of the division engineer at Philadelphia in November of the same year. In April, 1918, he was transferred to Lansdale, Pa., and in April, 1919, was appointed acting supervisor of the same division at Lansdale, becoming assistant supervisor at Trenton Junction, N. J., in October of that year, from which position he was promoted to supervisor of the Wilmington and Columbia division as noted above.

BRIDGE

J. F. Cookingham has been appointed master carpenter on the Chicago & Eastern Illinois, with headquarters at Danville, Ill., succeeding **A. S. Markley.**

A. H. King, supervisor of bridges and buildings on the Oregon Short Line, with headquarters at Pocatello, Idaho, has been returned to his former location at Salt Lake City, Utah.

Dennison Fairchild, supervisor of bridges and buildings on the Northern Pacific, with headquarters at Duluth, Minn., has been appointed acting supervisor of bridges and buildings on the Puget Sound division, with headquarters at Seattle, Wash., in place of **W. E. Bradley,** granted leave of absence.

PURCHASES AND STORES

J. E. Wharton, division storekeeper on the Pennsylvania, with headquarters at Toledo, O., has been appointed storekeeper, maintenance of equipment department, with the same headquarters, the position of division storekeeper having been abolished.

OBITUARY

Robert C. Sattley, valuation engineer of the Chicago, Rock Island & Pacific, died suddenly at his home in Chicago on December 31. He was born in Ferrisburgh, Vt., on November 26, 1856 and received his education at the University of Vermont, graduating in 1879. He entered railway service with the Northern Pacific the same year as assistant engineer and was promoted to superintendent of bridges and buildings in 1894, which position he held until 1905 when he became division engineer. In 1907, he was appointed assistant engineer on the Chicago & North Western, serving subsequently as locating engineer on the Denver, Laramie & Northwestern and valuation engineer on the St. Louis-San Francisco. In 1910, Mr. Sattley was appointed valuation engineer of the Chicago, Rock Island & Pacific, in which capacity he served at the time of his death.

Robert C. Sattley

Employees of the Union Pacific System, the Oregon Short Line and the Oregon-Washington Railroad & Navigation Company, have been notified by Robert S. Lovett, chairman of the Union Pacific System, and Carl R. Gray, president, that those companies stand ready to purchase Union Pacific common stock for employees. Employees may subscribe for from one to ten shares, payable in 24 equal installments, the company to receive six per cent interest on the deferred payments. The stock will remain the property of the company until paid for and the company will assume the payment of federal and state taxes.

The New York-New Jersey Port and Harbor Development Commission has completed its plan for the reorganization of the Port of New York and has submitted it to the state legislatures. This plan calls for improving and opening up for joint use the existing belt-line links in New Jersey and constructing other belt lines along navigable New Jersey waters and farther inland; building similar marginal railroads and utilizing with them the Long Island and the New York Connecting Railroad to form a belt-line system in New York; connecting the New Jersey and New York belt systems. At first this would be done by car ferry but ultimately by tunnel under the upper bay.

CONSTRUCTION NEWS

The Ann Arbor has awarded a contract to the American Bridge Company for the erection of a bridge over the Raisin river at Dundee, Mich.

The Atchison, Topeka & Santa Fe has awarded a contract for the construction of a one-story brick addition to its machine shop at Argentine, Kan., to Jerome Moss, Chicago, at an approximate cost of $45,000. The dimensions of the addition will be 102 ft. by 115 ft., and the improvements to be undertaken include the construction of an office, tool room, engine pits and drop pits. This road is accepting bids for the construction of a frame blacksmith shop with dimensions 40 ft. by 72 ft. at Newton, Kan., to cost about $10,000.

The Atchison, Topeka & Santa Fe will also build a complete ice-plant at Hobart station, Cal., which will cost approximately $500,000 and will include a 500-ft. icing dock, an office building, and a cooling tower. The company also contemplates rearrangements of its facilities at Calwa, Cal., to provide space for an addition to the existing ice-plant, which will cost $90,000. The Santa Fe will install a 120-ft. turntable at Clovis, N. M., at a cost of $46,000.

The Santa Fe contemplates an 11-stall addition to its roundhouse at Newton, Kan.

The Atlanta & St. Andrews Bay has applied to the Interstate Commerce Commission for authority to abandon service on a branch from its main line just north of Panama City, Fla., to St. Andrews, Fla.

The Chesapeake & Ohio contemplates the construction of a new passenger station at Covington, Ky. This road also contemplates the construction of a new roundhouse at Peru, Ind.

The Chicago & Alton contemplates the construction of a roundhouse at Ridgely yards, Springfield, Ill.

The Chicago, Burlington & Quincy is accepting bids for the construction of a hotel and restaurant at Cody, Wyo.

The Chicago, Rock Island & Pacific has awarded to the Roberts & Schaefer Company, Chicago, a contract for the installation of hoisting equipment in the company's coaling station at Selden, Kan.

The Chicago Union Station is accepting bids and plans to begin operation about February 2 on the work of wrecking the old Chicago & Alton freight house at Harrison street and the Chicago river, Chicago. This work will form the first step toward the construction of the new Chicago mail terminal on which the Union Station Company plans to begin work this spring.

The Cleveland, Cincinnati, Chicago & St. Louis is improving its yard facilities at Jeffersonville, Ind., by extending seven yard tracks at a cost of approximately $143,000. The company contemplates other terminal improvements at Jeffersonville in the future.

The Coon Bayou & Arkansas City has been denied application by the Interstate Commerce Commission far a certificate authorizing the construction and operation of a line two miles in length from a connection with the Missouri Pacific in McArthur, Ark., to lease an existing line about 1.3 miles in length, and to acquire trackage rights over the Missouri Pacific for a distance of 23.6 miles.

The Duluth & Iron Range will rebuild its station at Allen Junction, Minn., which was recently destroyed by fire.

The Fort Worth & Denver City contemplates extensions and improvements to its shops and engine house facilities at Fort Worth, Childress and Amarillo, Tex.

The Golden Belt has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line to cost $64,000,000 from Great Bend to Buckeye Township, Ellis County, Kan.

The Great Northern is accepting bids for the construction of a 500-ton frame coaling station at Troy, Mont.

The Great Northern also contemplates the construction of car repair shops at Minot, N. D.

The Gulf Coast Lines will build a new freight depot at McAllen, Tex., at a cost of approximately $20,000, and will make the necessary track re-arrangement to serve the new station properly, at a cost of about $1,500.

The Kansas & Oklahoma has awarded a contract to Strickland & Smedley, Forgan, Okla., for the construction of a line between Forgan and Liberal, Kan., a distance of 25½ miles, at a cost of approximately $300,000. The company contemplates extending its line to Trinidad, Colo., and has voted a bond issue to help defray the cost of this work.

The Louisville & Nashville is building yard facilities near Typo, Ky., which will be called Crawford Yard. The company is also constructing approximately 5 miles of second track on the Cumberland Valley division.

The Minneapolis, Northfield & Southern contemplates the construction of a 12-mile extension of its line from Northfield to Faribault, Minn.

The Missouri, Kansas & Texas is accepting bids for the construction of a roundhouse at Smithville, Tex.

This road contemplates extensions to its freight house ano rearrangement of its yard facilities at Kansas City, Mo., at an approximate cost of $100,000.

The Missouri, Kansas & Texas is also requesting proposals for the construction of a reinforced concrete inbound freight house, 50 ft. by 600 ft., with second-story office, 50 ft. by 100 ft., and platform 8 ft. by 600 ft. and 58 ft. by 100 ft., replacing present brick and frame station at Jefferson street and Ross avenue, Dallas, Tex.

The Morgantown & Wheeling has awarded a contract to B. M. Chaplin & Co., Morgantown, W. Va., for the construction of a second main track from Randall, W. Va., to Osage, a distance of one mile. The work will involve the construction of two small steel bridges.

The Pere Marquette, which was noted in the January issue as receiving bids for the construction of a frame freight and passenger station at Clifford, Mich., has awarded the contract for this work to Spence Brothers, Saginaw, Mich.

The Potato Creek has received from the Interstate Commerce Commission a certificate authorizing that company to construct an extension of 2.22 miles to a connection with the Pennsylvania at Hamlin, Pa., and to abandon 13.49 miles of its present line between Keating Summit and Norwich.

The Tennessee Railroad has received a certificate from the Interstate Commerce Commission authorizing it to construct a branch line for a distance of six miles from a connection with its main line at the mouth of Beech fork of the New river in Tennessee.

The Texas Midland has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line between Greenville and Commerce, Tex., a distance of 14 miles.

The Texas & New Orleans contemplates the construction of repair shops at Houston, Tex., to replace the buildings destroyed by fire on December 7.

The Toronto, Hamilton & Buffalo contemplates the construction of a subway under the tracks at Binkley's Corners, Ont., for which the Department of Public Highways, Toronto, Ont., is advertising for bids.

The Uintah Railway has applied to the Interstate Commerce Commission for a certificate authorizing the construction of four branch lines in Uintah County, Utah, respectively 19.36, 3.01, 1.4 and 1.19 miles in length.

The Union Pacific contemplates the construction of a roundhouse, blacksmith shop and repair shop at Fremont, Neb.

The Union Pacific received a certificate from the Interstate Commerce Commission on November 13, authorizing the construction of an extension in Scotts Bluff and Goshen counties, Wyo., with the condition that the construction should be completed on or before December 31, 1921. Another order was recently issued extending the time to September 30, 1922.

The Wabash contemplates the construction of a station at Macon, Mo., to cost approximately $31,000.

The Western Pacific has received permission from the California Railroad Commission to abandon that portion of the Tesla branch lying between Moy and Carnegie.

Correction—The Louisville & Nashville's award of contracts for equipment required for a 600-ton coaling station at Loyall, Ky., was incorrectly reported in the January issue, the item stating that the work had been awarded entirely to the Ogle Construction Company, Chicago. We find that this station will be constructed of reinforced concrete by company forces, that contract for the coal elevating machinery was awarded to the Ogle Construction Company, the contract for the gravity sand drying and handling plant to the Roberts & Schaefer Company, Chicago, and contract for the gate and apron fixtures to the Link-Belt Company, Chicago.

IRON AND STEEL

The Atchison, Topeka & Santa Fe has ordered 40,000 tons of rails from the United States Steel Corporation.

The Bureau of Foreign and Domestic Commerce recently compiled export statistics for the month of November which showed that spikes exceeded in weight and value the totals for any other month in 1920 with the exception of March, the weight of spikes exported being 3,979,631 lb. and their value $175,459. Rail shipments also showed a total of 67,708 tons valued at $4,088,626, while miscellaneous track material shipped aggregated $1,279,047.

The Chicago Union Station Company has ordered 700 tons of structural steel from the Bethlehem Steel Company for use in the construction of the Van Buren street viaduct, Chicago.

The New York, Chicago & St. Louis has placed an order for 3,000 tons of open-hearth rails, for 1921 delivery, with the Carnegie Steel Company, increasing its order from this producer to 9,000 tons.

The Southern Railway has ordered 5,000 tons of rails from the United States Steel Corporation.

The Virginian Railway has ordered 8,000 tons of rail from the United States Steel Corporation.

NEW YORK CENTRAL TRACK INSPECTION

The results of the annual track inspection of the New York Central for 1920 showed that the general average rating of the four divisions between New York and Buffalo was 82.3 per cent, with the Eastern and Syracuse divisions tied for first place with a rating of 82.7 per cent. The highest rating for a supervisor's division was secured by F. L. Vault on the Mohawk division with a rating of 83.2 per cent, with T. H. Gurnett on the Eastern division second with 83.1 per cent.

Premiums of $3 per month extra compensation were awarded to a total of 33 main line section foremen having the best track on their respective subdivisions. In addition, the foreman having the best section on each division, except the Electric division, received an added premium of $2 per month, making a total of $5 per month. The successful foremen receiving both premiums are as follows:

Foreman	Rating
John Andros, Eastern division	85.3
Charles Weinkauf, Mohawk division	83.9
Domenic Sampo, Syracuse division	84.3
Frank Ross, Rochester division	83.0
C. A. Saunders, Ontario division	84.0
Anthony Pietro, St. Lawrence division	85.0
Moses Duquette, Adirondack division	83.3
Walter D. Burger, River division	84.1
Manual Teats, Pennsylvania division	84.5

Premiums of $2 per month were awarded to 9 branch line section foremen and $3 per month to 10 yard section foremen. The branch line foremen receiving the award are: John Harold, Ardsley, N. Y.; James Cannon, Cohoes, N. Y.; Michael Giambattista, Salina, N. Y.; Frank Kopera, Buffalo, N. Y.; Patrick Reilly, Honeoyo Falls, N. Y.; Thomas Mitchell, Ogdensburg, N. Y.; John O'Brien, Kingston, N. Y.; James Brehaney, Westfield, N. Y., and A. Herdman, Glen Hope, Pa. The yard section foremen are Harry Palugo, New York, N. Y.; Thomas Desorbo, West Albany, N. Y.; Joseph Rogers, Utica, N. Y.; V. Voscash, East Syracuse, N. Y.; Melchior Gawron, East Buffalo, N. Y.; James Flynn, Rochester, N. Y.; J. McNamara, Oswego, N. Y.; Donato Tauroney, Watertown, N. Y.; Joseph Cirrilli, Weehawken, N. J., and A. Andrew, Cherry Tree, Pa.

SUPPLY TRADE NEWS

GENERAL

The Chipman Chemical Engineering Company, Inc., has removed its offices from 95 Liberty to 136 Liberty street, New York.

The Whiting Foundry Equipment Company, Harvey, Ill., has changed its name to **Whiting Corporation.** The Whiting Corporation remains under the same management and will make no change in its established operations or policies which have prevailed in the past.

The National Railway Appliances Company, 50 East Forty-second street, New York, with branch offices in Boston and Washington, and the Hegeman-Castle Corporation, Chicago, have discontinued the selling agency for the Clapp Fire Resisting Paint Company, Bridgeport, Conn.

The Great Western Contracting Company, Kansas City, Mo., has changed its name to the Rawlings Industrial Equipment Company. This organization is sales engineer for various manufacturers of power plant machinery and is the representative of the Conveyors Corporation of America, Chicago, handling its coal and ash conveyors. The company also represents the Springfield Boiler Company, Springfield, Ill., and the Cooling Tower Company, New York.

PERSONAL

John T. Reagan, for several years in the sales department of the P & M Company, has been appointed assistant general sales manager of the Creep Check Company with offices in the Terminal building, Hoboken, N. J.

J. W. Holman, superintendent of the Culbertson Construction Company, Youngstown, Ohio, has resigned in order to form the J. W. Holman Company, with office at Youngstown. The new company will engage in contracting, particularly railroad construction.

George S. Bigelow, formerly manager of the railway department of the Chicago Varnish Company, is now in charge of the railway department of the Mountain Varnish & Color Works, Inc., of Toledo, Ohio, with offices in the Railway Exchange building, Chicago.

C. E. Adams, vice-president of the Air Reduction Sales Company, New York, has been elected president to succeed **A. F. Blagden,** who has resigned to become associated with the American Dyewood Company, New York. **John McHugh** has been elected a director to succeed H. R. Hoyt, who died recently.

George E. Tebbetts, formerly with the construction and engineering division of Stone & Webster, Boston, Mass., and previous to that time bridge engineer of the Kansas City terminal, has become associated with the railroad department of the Roberts & Schaefer Company, engineers and contractors, Chicago.

F. Lavis will resume his independent practice as consulting engineer at 120 Broadway, New York City, specializing in transportation developments and especially in those relating to foreign countries. He has been retained by the American International Corporation, New York, with which he has been associated since its inception.

D. E. Sawyer has been re-elected general sales manager of the Pollak Steel Company, Cincinnati, Ohio, with office at 120 Broadway, New York; **S. K. Morrow,** manager of operations, has been appointed manager of sales for its three plants, with offices at the Cincinnati works; **C. G. Talbott,** assistant manager of operations, has been appointed manager of rolled products for the Marion plant; **A. C. Weihl,** superintendent of the Cincinnati plant, has been appointed general works manager in charge of operations and productions of the Cincinnati, the Chicago and the Marion plants, and **V. W. Prather,** cost auditor for the Cincinnati plant, has been appointed auditor of the three plants. **R. A. Mitchell** has succeeded Mr. Weihl as superintendent of the Cincinnati plant; **J. H. Deickman** has been appointed manager of materials and inspection of its three plants; **W. P. Woods** has been appointed auditor and **G. H. Tallaksen,** superintendent of the Chicago plant. The company has recently distributed a unique souvenir; it is a pen made in the form of a miniature standard M. C. B. car axle, with mechanical wheel seat and journal and rough turned center.

R. W. Levenhagen, secretary of the Sherwin-Williams Company, Cleveland, Ohio, has been elected vice-president in charge of auxiliaries of the Glidden Company, Cleveland. Mr. Levenhagen has spent the greater part of his life in the paint and varnish industry, having started with the Sherwin-Williams Company 25 years ago. He held various positions in the service of this company and rose steadily until he became secretary, which position he held until his recent election as vice-president of the Glidden Company. Besides serving as secretary of the Sherwin-Williams Company, he was vice-president and general manager of the Detroit White Lead Works, Detroit, Mich., and vice-president of the Martin-Senour Company, Chicago, for a number of years.

R. W. Levenhagen

F. L. Cook, sales representative, and also in charge of the publicity department of the Chicago Bridge & Iron Works, at Chicago, is now in charge of the Pacific Coast territory of this company, with offices in the Rialto building, San Francisco. **Charles H. Sheldon** is the Southern California representative, with headquarters in the Wright-Callender building, Los Angeles.

Harry L. Marsh, vice-president of the Thompson-Starrett Company, building constructors, New York, died on January 13 at Overlook Hospital, Summit, N. J. Mr. Marsh had been connected with the Thompson-Starrett Company since 1912, and had been one of its vice-presidents since 1915. He was born on July 23, 1875, at Ithaca, N. Y., and was educated at Cornell University. He began work as a draftsman in an architect's office at Ithaca. He went to Chicago in 1893 and served in the engineering department of the Chicago & North Western. He then served with architectural firms of Frost & Granger and Holabird & Roche, Chicago, and in this connection was associated with the design and construction of the Rock Island terminal, the Chicago & North Western terminal, and the Chicago & North Western office building, and many other public buildings. In 1912 he joined the staff of the Thompson-Starrett Company, in its New York office as general superintendent, and in 1915 was promoted to vice-president. As such Mr. Marsh was head of the construction department and supervised all the construction work of the Thompson-Starrett Company. During the period of the war he directed the work on the construction of Camp Upton, Yaphank, L. I., and the Fox

Harry L. Marsh

Hills hospital, Grasmere, Staten Island, N. Y. He also acted in an advisory capacity during the construction of the large powder plant for the United States government, known as the United States Explosive plant C, at Nitro, W. Va.

Michael H. Foley, a railroad contractor, died recently at his home in Los Angeles, Cal. He was the last of the four Foley brothers of St. Paul, who were pioneer railroad builders. They were Michael, Thomas, John and Timothy, the latter having died only recently.

George A. Post, who retired from the presidency of the Standard Coupler Company, New York, has been elected president of the Hudson River Bridge Corporation. This corporation has been organized by a large number of prominent citizens of New York City and New Jersey, to promote the building of a bridge across the Hudson river from Fifty-seventh street, New York City, to the high ground in New Jersey west of Weehawken.

R. F. Eissler has been appointed assistant to the vice-president of the Chicago Pneumatic Tool Company, New York, with headquarters in the company's new office building at 6 East Forty-fourth street, New York City. **W. C. Straub,** formerly district manager of the New Orleans branch, has been appointed district manager of the Pittsburgh branch to succeed Mr. Eissler, and **Ross Wyeth,** formerly attached to the Pittsburgh branch, has been appointed district manager of the New Orleans branch to succeed Mr. Straub.

William H. Sayre, president of the American Abrasive Metals Company, New York, died suddenly at his home in Glen Ridge, N. J., on January 6. He was born at Mauch Chunk, Pa., in 1865, and graduated from Lehigh University as a mechanical engineer in 1886, and since that time has been actively engaged in engineering work. He began his experience in railroad building in the Northwest. Mr. Sayre later became president of the International Contracting Company, executing many dredging contracts in New York and other harbors, and also served as a consulting engineer on the Cape Cod canal. He was among the first to apply electric welding commercially, having organized the Federal Electric Welding Company, New York, and the Anthracite Electric Welding Company, Wilkes Barre, Pa. In 1911 he organized the American Abrasive Metals Company, of which he was president until the time of his death.

E. M. Blake, production engineer, Charles R. McCormick & Co., San Francisco, Cal., and president of the National Association of Railroad Tie Producers, died recently at San Francisco. He was born at Taunton, Mass., in 1874. He received his education at Amherst College and Harvard University and entered the engineering field as assistant engineer of the Eastern Bridge & Structural Company, Worcester, Mass. From 1900 until 1902, Mr. Blake served as assistant engineer with the New York Rapid Transit Commission, leaving in the latter year to become a designer for the Brown Hoisting Machinery Company, Cleveland, Ohio. He became principal assistant engineer for his father, Percy M. Blake, in 1902, in which capacity he had charge of the construction of the Sebago Lake reservoir for the Portland Water Company, Portland, Me., and various other steam and water piping projects for a number of water works systems. In 1906, Mr. Blake became engaged in private practice in Boston and in 1908 was appointed manager of the Idaho Irrigation Company. In 1909 he entered private practice at Boise, Idaho, and from 1911 until 1915 served as engineer-in-charge of the improvement of the Neponset river under the Massachusetts State Department of Health. During 1916 he was special investigator for the Harbor & Land Commission of Massachusetts and on May 1, 1916, was engaged by the Holbrook, Cabot & Rollins Corporation as engineer on the new drydock at South Boston, Mass. In December, 1918, he became associated with Charles R. McCormick & Company as production manager, which position he held at the time of his death. Mr. Blake was active in the American Wood-Preservers' Association and was elected president of the National Association of Railroad Tie Producers in May, 1920.

E. M. Blake

Joseph E. Nelson, president of Joseph E. Nelson & Sons, railroad contractors, with offices in Chicago and Kansas City, died suddenly on Friday, January 14, while making a final inspection of the freight and passenger terminal of the Illinois Central at Centralia, Ill. Mr. Nelson was born in New Jersey on January 17, 1857, and came to Chicago in 1869 and grew up in that city. He entered railroad and building construction as a young man and was actively engaged in this work throughout his entire life. In the early eighties he was engaged as construction superintendent on the extension of the Chicago & North Western in Nebraska. In 1889 he served as general superintendent on the construction of the first buildings for the University of Chicago and later served as superintendent for the William Grace Company on the construction of Worlds Fair buildings in Chicago. Following the completion of this work in 1893, he entered general building contracting on his own account and a year later began specializing in railroad structures. During the late nineties he was engaged in extensive work on the Chicago & Alton and the Atchison, Topeka & Santa Fe and during the last 20 years has carried on building construction for practically all of the middle western railroads. In 1908 he organized the contracting firm of Joseph E. Nelson & Sons and was actively engaged in the management of this contracting firm up to the time of his death.

Joseph E. Nelson

TRADE PUBLICATIONS

Osgood Railroad Ditchers.—The Osgood Company, Marion, Ohio, has recently issued a 16-page illustrated bulletin descriptive of the railroad ditcher manufactured by this company. The data includes the specifications of the ditcher, both for clam-shell bucket and crane work, while line drawings show the principal dimensions, etc. The text is devoted to describing the various parts of the equipment, such as the frame, axles, boiler, hoisting machinery, etc., while illustrations show the completed equipment in operation, as well as the individual parts.

Engineers' and Surveyors' Supplies. A 40-page catalogue of field and office supplies has been recently issued by the C. F. Pease Company, Chicago. This book lists drawing, profile and cross-section papers; tracing cloths; blueprint papers and blueprinting machines; drafting room furniture and such field supplies as transits, levels, ranging poles, leveling rods, etc. The book is well illustrated, while prices and descriptions of each article are given.

The House Committee on interstate and foreign commerce has submitted a favorable report on the bill introduced by Representative Winslow to specifically authorize the Secretary of the Treasury to honor certificates of the Interstate Commerce Commission for partial payments to the railroads on account of their guaranty for the six months' period following the termination of federal control. A minority report was filed by Representative Sims.

RAIL ANTI-CREEPERS

It is a fact that if rail anti-creepers are not applied a large percentage of costs are absorbed in unnecessary expense in maintaining track.

APPLY THE

VAUGHAN P & M HENGGI

THE P. & M. CO.
CHICAGO
NEW YORK

THE P. & M. CO.
LIMITED
MONTREAL, CANADA

THE P. & M. CO.
(ENGLAND) LTD
31, BUDGE ROW, LONDON.

Save Time in filling your tenders
Prevent damage from Water Hammer

WITH THE

POAGE Style H WATER COLUMN

An Instantly Adjustable Spout

Quicker work in filling tender tanks is possible with the Poage Style H Water Column equipped with the Fenner drop spout.

A vertical range of five feet and a lateral range of three feet make accurate spotting of the tender unnecessary.

The spout works equally well with tenders of different heights.

The spout avoids the usual winter troubles in cold climates. It has a non-freezable telescopic joint. This is entirely open. There is no packing of any sort. Yet it does not leak or waste a drop of water.

Quick Closure Without Water Hammer

Even on high pressure water mains, the Poage Style H Valve is closed quickly without danger to the mains from water hammer. The flow is cut down 85 per cent very rapidly and the remaining 15 per cent more slowly.

Tests by the University of Illinois have shown that this principle provides the quickest closure and makes water hammer impossible.

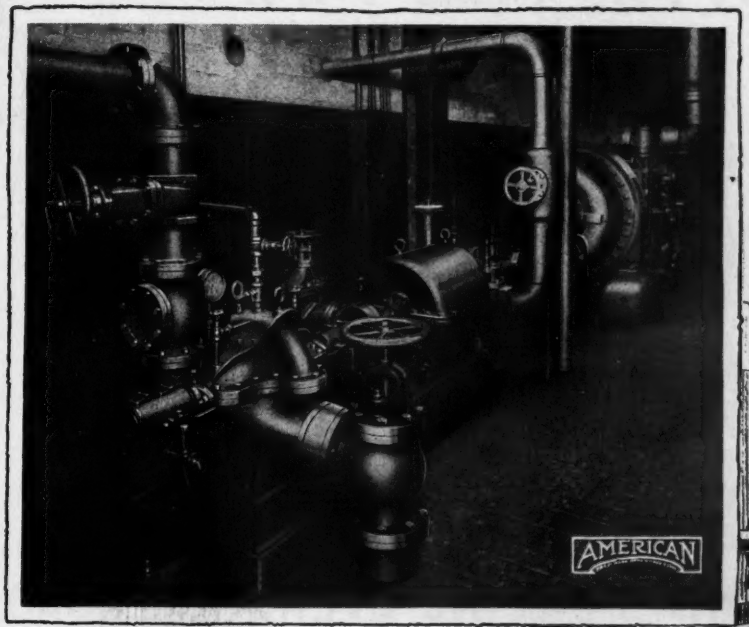
Investigate the Poage Style H water column. Give it a thorough trial.

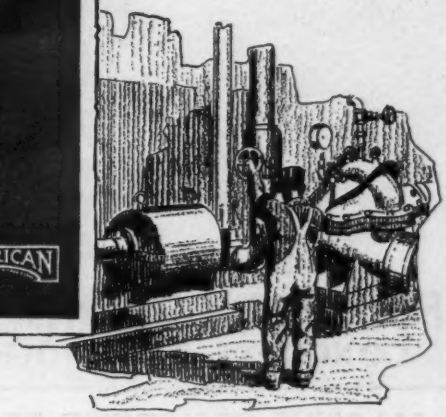
Manufactured exclusively by

The AMERICAN VALVE & METER CO.

Cincinnati, Ohio

AMERICAN





Six Years of Consistently Good Service

Back in 1914, The American Well Works installed the steam turbine driven centrifugal pump pictured above, in the Blue Island Power Plant of the Public Service Company of Northern Illinois. The installation is used to take water from the river and deliver it into the general distributing system of the plant—and it is our information that day in and day out for the past six years, it has been giving uniformly reliable service with a minimum of maintenance expense.

The fact is that far from being an unusual case, this installation has simply lived up to the service expected of it. It is natural to suppose that half a century of experience would produce pumps of such quality.

The complete unit is an American 6-inch horizontal, single stage, double suction, centrifugal pump, completely bronze fitted, driven by a 53 H. P. split shell Kerr steam turbine, operating non-condensing.

Our engineers will gladly help you solve your plant water supply problems.

THE AMERICAN WELL WORKS

General Office and Works
AURORA, ILL.

Chicago Office
FIRST NATIONAL BANK BLDG.

MASSEY CONCRETE PRODUCTS CORPORATION Peoples Gas Building CHICAGO, ILLINOIS

New York 50 Church Street | Pittsburgh Oliver Building | Atlanta Candler Building | Dallas Sumpter Building | St. Louis Railway Exchange Building | Salt Lake City 925 S. 6th Street, West

For Seventeen Years

JOHNSON
Brass Well Screens

have helped to give railroads the water essential to their operation. More than this, these screens have done more for the wells in which they are installed than would have been possible for any other brass screen. The reason for this is worth investigating.

Our catalog describes the features which are absolutely unique to Johnson Well Screens, and tells of their bearing on everyday performance. Any person interested in developing ground water supplies will find it worth reading. *A request will bring this booklet to you.*

Manufactured by

Edward E. Johnson, Inc.

2304 Long Avenue

St. Paul, Minnesota

How Can Diamond Fibre Help You?

Do you know? Every railway maintenance engineer should not only be thoroughly acquainted with railway insulation of all kinds, but he should also be very well informed on the material from which the railway insulation is made. When he knows he usually specifies Diamond Fibre. Tear out this ad, pin it to your letterhead, and mail it to us. We will send you complete information.

Dept. 12

Diamond State Fibre Company

Bridgeport (Near Philadelphia), Penna.

Branch Factory and Warehouse, Chicago

Offices in Principal Cities.

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A Betterment In Track Maintenance

Small in Size Great in Importance

The Hipower, although small in size, performs very important functions in track maintenance. The high reactive pressure distributes the force of train blows to all bolts, cushions the heads and nuts—and compensates for any wear and stretch of bolt.

HIPOWER NUT LOCKS

unlike plain coil, work on three curved points of bearing, whose width reaches from bolt thread completely across the face of the nut. This gives equal strain on the bolts and a full and correct bearing for the soft face of the nut which is a surface subject to wear.

THE NATIONAL LOCK WASHER CO.

Established 1886

Newark, N. J.

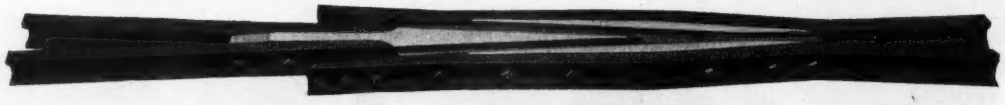
New York Chicago Detroit

Frogs—Switches—Crossings

Special Track Work

MANGANESE STEEL

AND PLAIN RAIL CONSTRUCTIONS



A. R. E. A. Standard No. 10 Railbound Manganese Steel Frog.

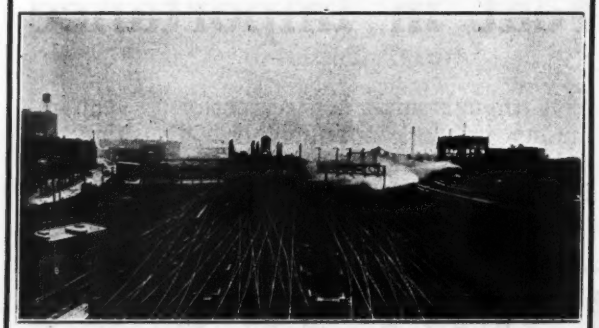
Originators of the Use of Manganese Steel in Track Work

WM. WHARTON JR. & CO., Inc.

EASTON, PENNA.

Subsidiary of Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

Other Plants: Philadelphia Roll & Machine Co., Philadelphia. Tioga Steel & Iron Co., Philadelphia.



Protection for Signal Bridge

Signal bridges, towers and railroad bridges are exposed to gases and fumes from engines in addition to the elements.

Because of this fact they should be protected with a paint that is capable of withstanding such corrosive agents. Such a paint as

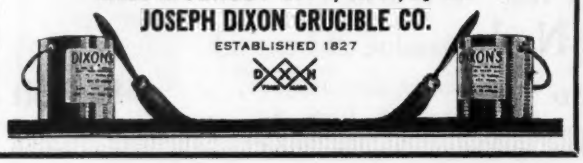
DIXON'S Silica-Graphite PAINT

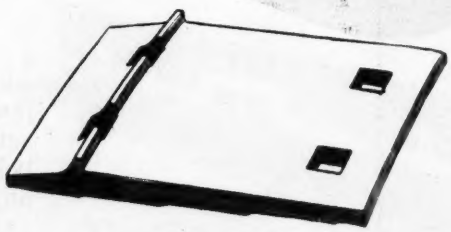
It has this protective quality because of its peculiar pigment flake silica-graphite. Write for long records of service and Booklet No. 187B.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE CO.

ESTABLISHED 1827





The Lundie Tie Plate

The Lundie Tie Plate is widely acknowledged by railroad men having such plates in track, as promoting decided economy in rail wear, in holding track to gauge and in giving easy riding track. It will far more than pay for itself in reduction of Operating Expenses.

The features of the plate are—a sloping seat inclining the rail, so reducing abrasion and internal stresses in the rail to a minimum—a true camber promoting easy riding—and a bottom, as shown in the cut, so seating itself on the tie that the track is held firmly to gauge without injury to the tie.

The combination of these features, or their mechanical equivalent, is covered by Letters Patent, supported by other Patents covering certain individual features of the plate. Railroad companies pay no royalties on its authorized use.

The Lundie Engineering Corporation

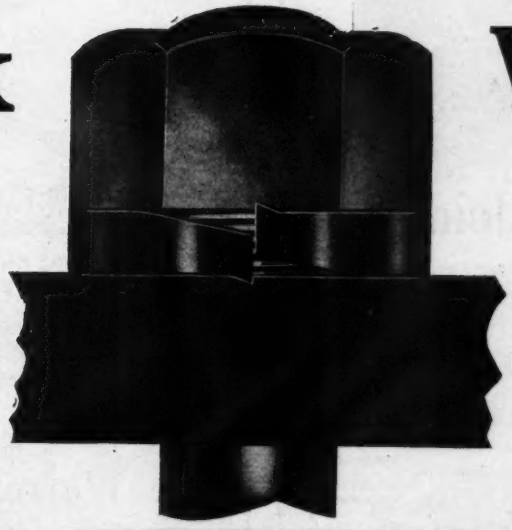
920 Broadway, NEW YORK

Chicago Office, 30 North La Salle Street

POSITIVE

The Genuine

Lock Washer



Holding Power?

You cannot doubt the ability of the POSITIVE LOCK WASHER to hold the nut in place, when the *upper barb imbeds itself in the nut* and the *lower one in the face of the plate.* These sharp points are hard; they don't wear off. The faces of the washer are flat, as the material from which the Positive Lock Washer is made is Keystone shape steel—*the best procurable.* The design, workmanship and finish of the POSITIVE LOCK WASHER is scientifically planned to make it function 100%—and it POSITIVELY does it, on every installation.

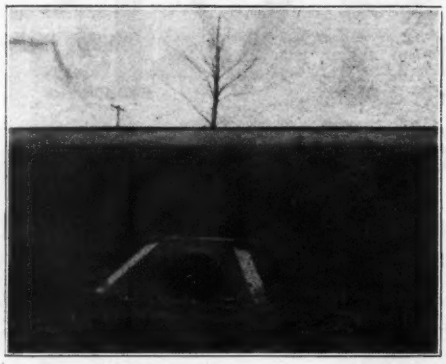
Manufacturers also of Plain Type Lock Washers

The Positive Lock Washer Company

Main Office and Factory
NEWARK, N. J.

Foreign Office
THE POSITIVE LOCK WASHER COMPANY
80-84 James Watt Street
Glasgow, Scotland

Pacific Coast Office
H. L. VAN WINKLE COMPANY
160 Beale Street
San Francisco, California



National Lock Joint Pipe

comes to you in 3, 4 or 5 foot lengths. That's what makes it so easy to handle and install. No waste. No piles to drive. No fills to remove. No tunneling. Cast from pure remelted Alabama pig iron, which will not rust.

Send for our interesting catalog.

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Chicago Office - - - - - - Peoples Gas Bldg.
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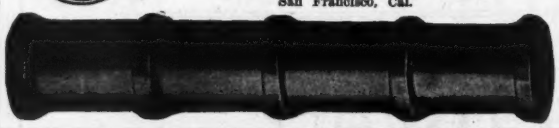

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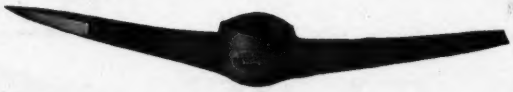


No. 5

Made of best high-grade open hearth steel, hammer forged and correctly tempered. Finished in black with polished points.

The Warren Tool & Forge Company

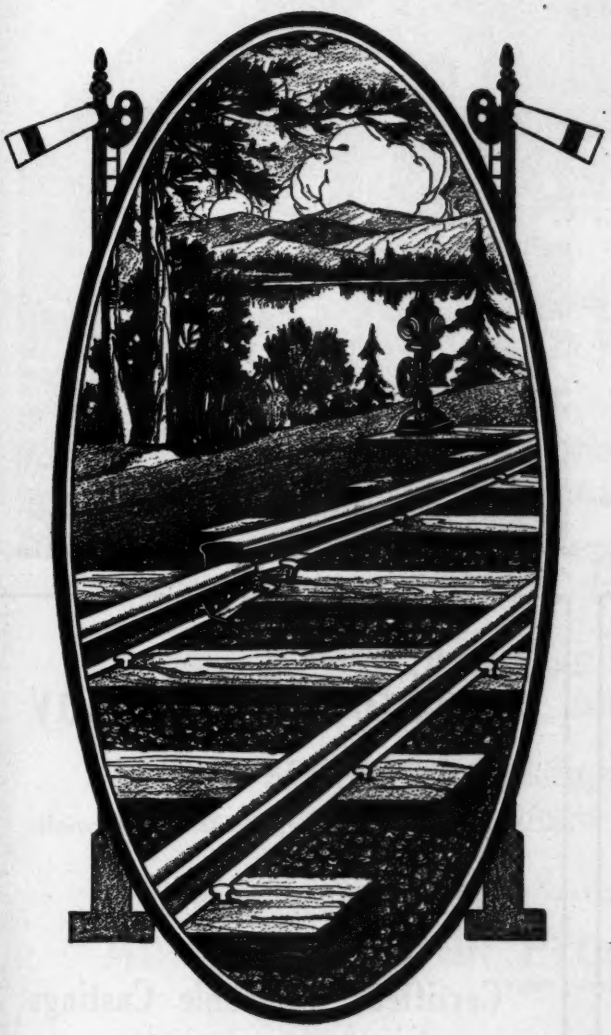
243 Griswold Street : WARREN, OHIO
U. S. A.

TO reach by circular the different departments of a railroad that have to do with the maintenance of the road would require several hundreds of dollars in postage, addressing and time spent in obtaining names and addresses of the officials of those departments.

Send your message to them in the advertising section of the Railway Maintenance Engineer.

It goes NOT to one man of each department but to ALL the men of ALL the departments interested in maintenance work. Keep in touch with them. Keep your name before them.

Danger



IT is dangerous to life and property, to leave ties and timbers unprotected.

It is dangerous to half protect them with a substitute oil. Get full timber insurance by using

REILLY'S IMPROVED PERMANENT PATENTED CREOSOTE OIL

The World Standard Wood Preservative

It is pure creosote oil —full bodied—no viscid tar adulterant to resist penetration—no volatile elements to evaporate and dissolve.

Reilly's Permanent Creosote Oil makes wood last because the oil lasts.

"It has proven years better"

REPUBLIC CREOSOTING COMPANY

INDIANAPOLIS, INDIANA

Plants: Indianapolis Minneapolis Mobile Seattle Norfolk

Aeron System

Portable Painting Equipment

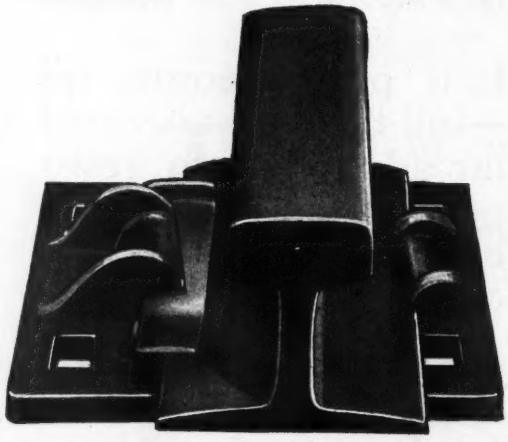
Sold on a strictly guaranteed-to-make-good basis

PAINTING EQUIPMENT FOR REAL SERVICE—
Getting more and better work done with fewer workmen is accomplished with the Aeron spray-painting equipment.

No better demonstration of this REAL SERVICE could be had than on bridge painting. This class of work is done at least 5 times faster, or with one-fifth the usual number of men, with the Aeron. The spray reaches every crack, corner and part, resulting in the application of a more thorough, longer lasting protective coating. No more paint is required. There is no costly replacing of brushes. The outfit is easy to handle, inexpensive to operate, and on the job every day.

Further facts that will apply to your painting problems gladly mailed.

The DeVilbiss Mfg. Co.
3682 Detroit Ave. *Toledo, Ohio*



TRASCO ANCHOR PLATE

A Combined Anti-Rail Creeper and Tie Plate

Easily and Quickly Applied.
Tightens Automatically.
Always in View and Out of the Ballast.

When you can't hold your rail with any other anchor, try the TRASCO. They are economical in the long run.

TRACK SPECIALTIES CO., Inc.
29 Broadway, **NEW YORK**

The Stowell Company

FOUNDERS AND MANUFACTURERS

South Milwaukee, **Wisconsin**

"Certified" Malleable Castings
Electric Steel Castings

Castings made, handled and tested in accordance with rigid and scientific methods.

Mail us your inquiries

Get All There Is In It!

FOR ALLOYING, DEOXIDIZING AND SOLID-CASTING ALL METALS
ALL METAL BORONIC PRODUCTS IN SHOT FORM
MADE IN AMERICA
FOR ALL THE WORLD
READING, PA. THE HOME OF BORONICS

What present day railroading requires is the best service of any element that enters into its production—material as well as personnel.

Much of the quality of the shop output depends upon the quality of the metal used in repair parts.

Boronic Products

insure getting all there is out of the original metal by the elimination of deleterious elements.

Their use means cleansing, increasing tensile strength, making the material uniform all through.

Address all American Inquiries to

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To the Metal Manufacturer or the Individual Mixer of Metals:

PLEASE USE THIS COUPON

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Gentlemen:—Kindly send me complete details regarding the many ways whereby I can economize by using Boronic Alloying Metals.

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☞ Our literature mailed to employer and employee who aim for IMPROVED PRODUCTS

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Miles are irreducible

but time is not. We reduce the time it takes for a gang to cover a certain number of miles of track, by carrying them on a Fairmont motor car.

The amount of work is reducible

but not to anywhere near the amount or percentage that the time in getting over the track is reducible.

Fairmont has led

in the development of motor cars, which has made this large time saving possible. And Fairmont continues to lead in the development of features which increase the service and dependability of the motor car.

Fairmont's most recent contribution to longer life and better service from motor cars, is the Fairmont Ball Bearing Motor.

Fairmont Gas Engine & Railway Motor Car Company

FAIRMONT MINNESOTA

THE
SPRACO PAINT GUN

(It's a BETTER Gun)

Insures Superstructures and Rolling Stock From the Ravages of the Weather

The Spraco Paint Gun works anywhere. It saves you money and it saves you time. The average saving is 30 to 40%.

Puts the Paint Where You Want It—

DOES NOT SPATTER

Write for Bulletin No. P-28

SPRAY ENGINEERING COMPANY
BOSTON, MASS.

Mfrs. also of Spraco Air Washers and Cooling Ponds, Spraco Cement Sprayers, Spraco Nozzles, Vaughan Flow Meters, etc.

Classified Advertisements

Use this section when seeking a new man, a new position, or when buying or selling second-hand equipment.

Rate is 5c a word a month. Minimum charge, $1.00. Remittance must accompany each order. Address

Railway Maintenance Engineer
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608 South Dearborn Street, Chicago

Position Wanted:

Practical Trackman, competent and energetic, desires position as Roadmaster, Assistant Roadmaster or General Foreman.

Personal record clear and up-to-date, age 43, married. Address: Box No. 163, *Railway Maintenance Engineer*, 608 South Dearborn Street, Chicago.

Pelton Steel Co.

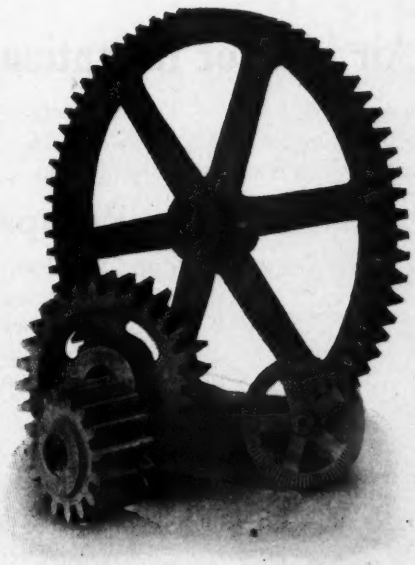
MILWAUKEE, WISCONSIN

Manufacturers of

Open Hearth and Electric Castings

of

Plain Carbon Alloy or Manganese Steel



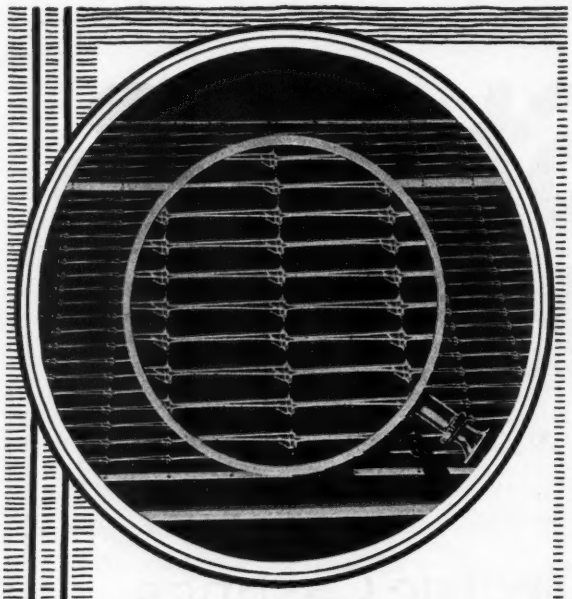
Under intensive railway traffic demands, no chances ought to be taken in maintenance work with any cast steel parts that are not of the highest standard of quality.

Bridge castings, gears and the like made of inferior material may become a source of great danger and are almost certain to cause traffic delay.

High grade steel castings are a necessity.

PELTON STEEL CO.

Knows how to make them
Makes them every day
Is organized for quality production
Gives exceptional service for ordinary prices.



A Permanent Sag Impossible

THE "give" in the Romelink spring fabric makes a permanent sag almost impossible. (Also, under the rustless, sagless fabric, you see the extra cross brace bands.)

The Romelink spring fabric is insurance against junking the bunk. Where there is proper "give," rough usage cannot pull the whole bunk out of shape.

The new "99" all metal bunk, which is equipped with this Romelink fabric, is unique among industrial bunks. The new double locking button system replaces the weak points of the old-style knockdown —the braces and hinge supports. The spring frame of the "99," sliding into position, automatically pulls the entire bunk tight and true. That means years more of service.

Write for complete information on the Romelink system.

Southern-RomeCo.

Branch of Rome Metallic Bedstead Company

619 W. Pratt St., Baltimore, Md.

ROME LINK "99"

RU-BER-OID
ROOFING

The original asphalt ready-to-lay roofing. Made from the same formula for over 28 years.

Smooth surfaced, fine talc dusted finish. Special large-headed sherardized (zinc impregnated) nails and Ru-ber-ine Cement in each roll.

Ru-ber-oid Roofing wears longer than ordinary prepared roofings, therefore, most economical.

RU-BER-OID UNIT SHINGLES

Green or red, slate surfaced, 8"x15¼", 5 inch exposure.

Ru-ber-oid Giant and Hercules Building Papers

Other Railroad Products

Ru-ber-oid Burlap Plastic Roofing
Impervite for Cement-Waterproofing
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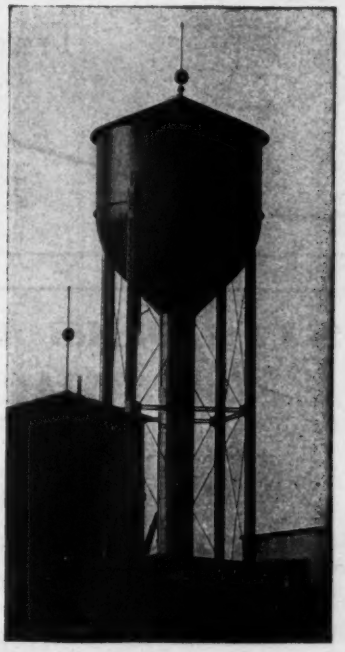

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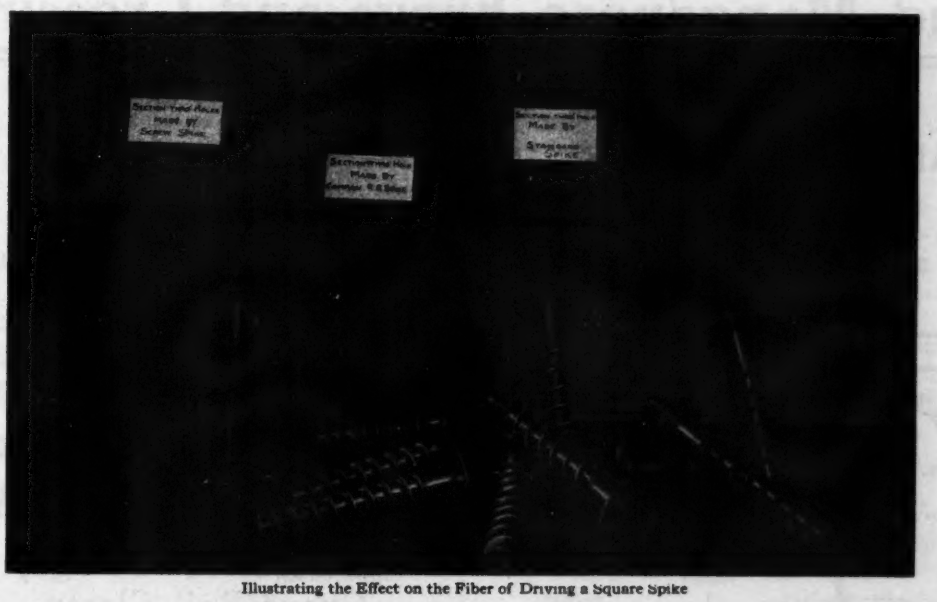

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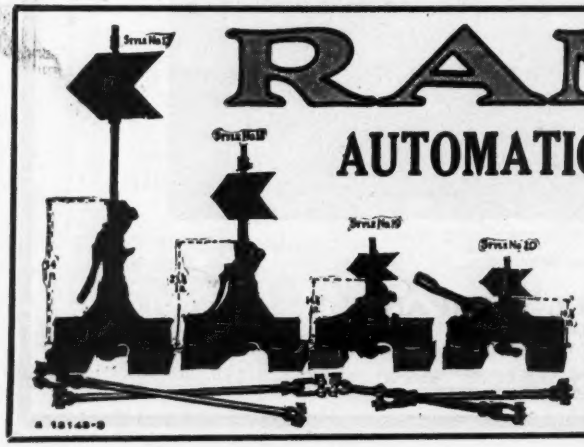

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Chicago, Burlington & Quincy R. R. (Burlington)
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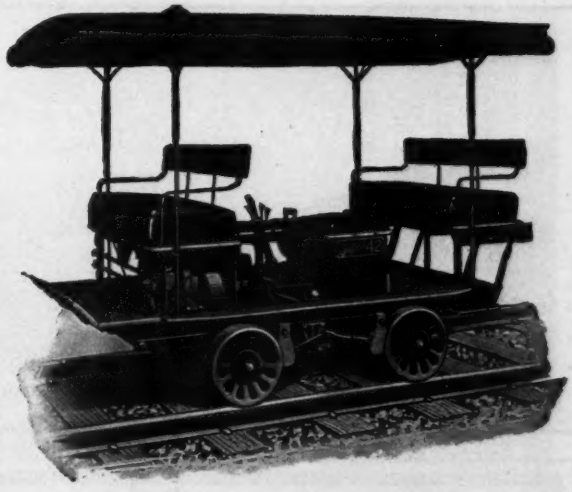

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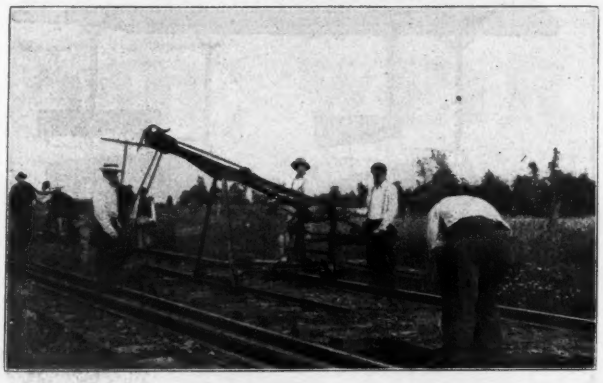

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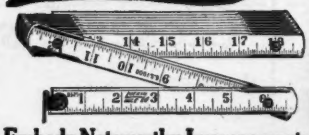

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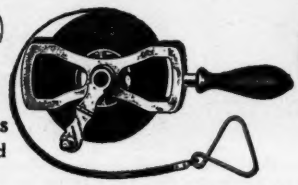

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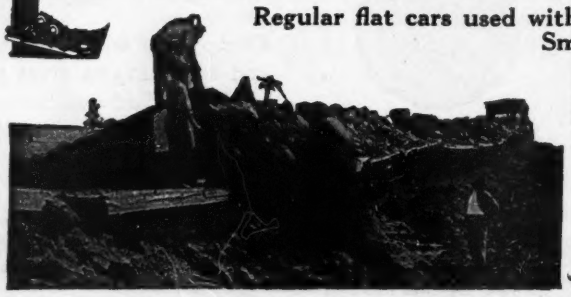

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